Taxes, Employment Growth and Firm Behavior in Uganda

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Dedication

To my mother, Oliver Neumbe, for her patience and never ending love

Abstract

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In this dissertation, the focus is on taxes, employment growth, and firm behavior in Uganda. Chapter 1 studies the relationship between corporate effective tax rates and firm size, where firm size is measured by a firm's gross income in a given fiscal year. In the past two decades, the debate on how high corporate tax rates should be has dominated tax policy discussions in developing countries. However, corporate tax rates do not reflect the true burden of a tax since they ignore the effect of allowable deductions, which are captured in effective tax rates. The corporate tax rate in Uganda is a flat rate of 30 percent. In theory, every firm regardless of size should pay the same rate. However, the effective tax rates differ from the stated tax rate because of the differences in the ability of firms to minimize their tax liability. There are two competing theories on how the effective tax rate changes with firm size – the political power theory favoring lower taxes for larger firms, and the political cost theory suggesting higher taxes for the larger firms.

After accounting for structural differences of firms, such as profits for tax purposes, the nature of their economic activity, and other time-invariant characteristics, within-firm variation is used to estimate the effect of firm size on effective tax rates. The results reveal a negative effect of firm size on effective tax rates, which implies that the largest firms shoulder a lower burden of the tax relative to smaller firms. This negative effect is robust to correction for outliers, and it persists when allocation to the large or the medium taxpayers' offices are used as instruments for firm size. In addition, there is evidence that supports a non-linear relationship between firm size and the effective tax rate; the effect is quite steeply negative for small firms but mostly flat in the middle range, and then becomes negative again for large firms.

Chapter 2 focuses on estimating the impact of increases in excise tax rates on firms' sales revenue, firm profits, and government excise tax revenue in Uganda. In the quest to raise sufficient tax revenue, tax policy changes in most developing countries tend to increase tax rates instead of simplifying the tax system. Increases in tax rates tend to have costs that are unintentionally ignored by policymakers. In this chapter, tax returns data for four financial years are used to estimate the effect of changes in excise tax rates on specific goods (motor vehicle lubricants, fuels, confectionaries, cigarettes, beer, wine, and furniture) on firms' reported sales revenue and profits – the two outcome variables. While allowing for non-parallel linear trends, the effect of the change in excise tax rates is estimated by comparing outcome variables of treated firms to those of the comparison group. The results suggest that the sales revenue for treated firms decreased by 11 percent and 20 percent in the first and second years post-tax change, respectively, relative to the

comparison group firms. Firms' profits for treated firms also decrease on average, by 27 percent in the years post-tax change. Given the decreases in sales revenues and profits, the evidence in Chapter 2 suggests that government tax revenues from treated products significantly decreased by 83 percent relative to excisables whose tax rates were not changed. The findings in this chapter suggest that excise tax rates in Uganda may have been increased to rates that are far above what is optimal; any further increases in such rates may not result in any increases in government revenue, but rather have detrimental effects on firms' sales revenues and profits.

Chapter 3 investigates how formal employment growth varies by firm size – firm size is measured by quintiles of total employee compensation. In many developing countries, tax and industrial development policies tend to be geared towards ensuring that small and medium enterprises survive long enough to grow and become relatively large companies. However, little is known about how employment growth rates vary with firm size as measured by quintiles of total employee compensation and age. Using business income tax returns data from Uganda, this paper presents ordinary least squares estimates to investigate how employment growth varies with firm size and age. The main findings suggest that, contrary to what has been found for U.S. firms, employment growth increases with firm size in Uganda even after controlling for firm age and other firm-specific characteristics. In addition, these patterns are also observed in specific sectors, such as construction, wholesale and retail trade, finance and insurance, and accommodation and food services. Finally, large young firms create the most formal sector jobs in Uganda, but they also destroy the most as well. Net formal employment

growth increases because the large young firms create more jobs than they destroy. These findings are robust to the use of other sources of data that include both formal and informal enterprises.

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Chapter 1

Effective Corporate Tax Rates and Firm Size: Evidence from Uganda

1.1 Introduction

Governments in developing countries often choose their tax policies not only to raise revenue for public expenditures but also to generate incentives for savings and investment. In designing tax policies to attain these objectives, it is important to appreciate that the economy grows much faster when there is minimal interference from a tax system (Reed, 2008). Providing incentives in the form of "generous" allowable deductions creates discrepancies in a tax system. Even when tax incentives are available to all firms, they could be used differently by firms of different sizes, hence generating variation in average corporate effective tax rates by firm size.[1]

Uganda has a corporate income tax, and corporations are subject to this tax on both their domestic and their foreign income at a rate of 30 percent, regardless of their size. Corporations are allowed to deduct from their taxable income expenses incurred in generating that income, and they also receive a tax credit for taxes paid in other tax jurisdictions. Nonresident corporations are subject to the same taxation regime on the portion of their income earned in Uganda. In addition to the expenses incurred in generating income, corporations (both resident and non-resident) are also allowed to deduct depreciation and interest expenses, and expensing is also allowed for purchases of low-value assets. Finally, all firms are allowed to carry forward indefinitely their losses, and agro processors and exporters of finished products are generally exempt from the

[1] Average corporate effective tax rates are defined as the share of firms' gross/accounting profits spent on corporate income tax payments - referred to as effective tax rates in the rest of the chapter.

corporate income tax.[2] The generous deductions and exemptions from this tax are used differently by firms of different size, which results in different effective tax rates by firm size. In this chapter, I therefore, estimate the effect of firm size, measured by gross income, on effective tax rates in Uganda and comment on the level of progressivity in firms' gross income of Uganda's corporate income tax.

In the last two decades, developing economies have either come under pressure from multinational corporations to reduce corporate tax rates or tried to encourage new investment by providing generous deductions and exemptions from that tax (Keen and Simone, 2004). Such exemptions may attract new investments to places that otherwise would be unattractive to investors, but they also make the tax system less efficient and more complex to implement. In addition, they cause disparities in effective tax rates. The disparities arise because of the differences in firms' ability to exploit tax deductions and exemptions. For example, even though large firms with high tax liability attract scrutiny from tax administrators (Zimmerman, 1983), they are also more likely to hire tax planners to lower their liability (Siegfried, 1974; Becker, 1983; Mascagni and Mengistu, 2017; Carreras et al. 2017; Stickney and McGee, 1982; Stigler, 1971). In contrast, smaller firms with fewer resources available to exploit tax preferences are likely to face a higher effective tax rate.

[2] The provisions that exempt firms and provide for the deductions are clearly stipulated in Uganda's Income Tax Act, Cap 340.

The variability in effective tax rates reflects disparities in the ability of firms to exploit ambiguities in the tax law, weaknesses in tax administration, and limited access to tax information by smaller firms. The findings in this chapter, therefore, generate evidence that will aid policymakers in Uganda and other developing countries to improve their tax systems. In particular, the tax system should not be designed to place small firms at a tax disadvantage. The large informal sector in most developing countries may force the tax authority to deny "legitimate" expenses by formal firms that trade with informal firms because of lack of third party information. This leads to a high effective tax rate on such firms. When designing tax systems, policymakers should consider the structural challenges that firms face, and develop targeted tax information programs aimed at making taxes less of a burden on firms.

The debate on effective tax rates and firm size dates back to the early 1980s, when the Citizens for Tax Justice (CTJ) demonstrated that the corporate effective tax rates were not fairly distributed in the United States, which influenced the 1986 Tax Reform Act; this led to a significant increase in government revenue in the United States (Gupta and Newberry, 1997). However, analyzing the relationship between effective tax rates and firm size was limited to the United States until the late 1990s and early 2000s, when other countries also started exploring this relationship. Kim and Limpaphayom (1998) explored the relationship for countries in Asia (Hong Kong, Malaysia, Korean, Taiwan, and Thailand), and they found a negative relationship. Yet they also suggested that the

direction of the relationship depended on the choice of the method used to measure the effective tax rate. Richardson and Lanis (2007) found that firm size does matter in determining effective tax rates in Australia. In contrast, Nicodème (2007) used the number of employees as a measure of firm size for 21 European countries and found a negative relationship. On the other hand, Lazar (2014) found that firm size does not matter for Romania's nonfinancial Bucharest Stock Exchange listed companies.

In contrast, the literature from developing countries is very rare, largely because of limited access to useable tax data, which speaks to the importance of the findings in this chapter. After taking into account structural differences of firms, such as profits for tax purposes, the nature of economic activity, and other time invariant characteristics, this study uses within-firm variation to estimate the effect of firm size on effective tax rates. The analysis unveils a negative effect of firm size on effective tax rates for Ugandan corporations; this result is robust to adjustments for outliers, and it persists when assignment to the large or the medium taxpayers' office are used as an instrument for firm size.

In addition, there is evidence that supports a non-linear effect; this effect is steeply negative for small firms but mostly flat in the middle range, and then becomes negative again for large firms. This evidence contributes to the scarce literature on effective tax rates in developing countries and should also help policymakers in Uganda

and other developing countries think more about how their tax policies translate into the corporate tax burden. The findings also contribute to the policy discussion of how high corporate tax rates should be in developing countries. Specifically, Uganda has a corporate income tax rate of 30 percent, but this rate does not reflect the true burden of a tax. The effective corporate tax rate is in fact as low as 6 percent. Reducing the corporate tax rate without any changes to allowable deductions will lead to a significant loss in government revenue.

Gauthier and Reinikka (2006) investigated the impact of tax reforms implemented in Uganda in the mid-1990s, and how they could have affected the distribution of the tax burden. They base their analysis on survey data collected from 243 firms, and they find that tax exemptions in the mid-1990s benefitted large businesses disproportionately and that medium-sized firms shouldered a higher tax burden. However, the Ugandan economy has evolved considerably since the mid-1990s, and so has the tax system. In particular, the Uganda Revenue Authority has fully transitioned into a "semi-autonomous" body, there has been a transition from paper-based tax returns to electronic filing, and exemptions have been streamlined, although not totally eliminated. Indeed, as will be seen below, the findings in this chapter differ from those of Gauthier and Reinikka (2006) since small firms face the highest effective tax rates and not the lowest.

Contrary to the findings of Gauthier and Reinikka (2006), Mascagni and Mengistu (2017) and Carreras et al. (2017) provide evidence, from Ethiopia and South Africa, respectively, that suggests a U-shaped relationship between the effective tax rate and firm size, which implies that medium-sized firms bear a disproportionately low tax burden as compared to smaller and larger firms. These results are somewhat consistent with the findings in this chapter for small and medium-sized firms, the exception being that as firms get much larger the effect continues to be negative.

Other developing country evidence suggests that political connections play a significant role in determining effective tax rates (Adhikari et al., 2006), which is consistent with the thought that larger firms are likely to have more political connections, which they exploit (Stigler, 1971; Becker, 1983) to persuade policymakers to design tax legislation in their favor. Unfortunately, the effect of political connections is not explored in this chapter due to data limitations.

Corruption in tax administration cannot be disentangled from the relationship between effective tax rates and firm size, since bribery can lead to misreporting of income and related expenses, which can lead to measurement error problems. In response to these problems, developing countries in both Africa and Latin America have created "semi-autonomous" revenue authorities in order to free tax authorities from the stringent rules of public service and to minimize political interference in the day to day operations of the tax authorities.

The “semi-autonomous” status of these agencies allows them to pay high wages to mitigate bribery, but evidence from Tanzania suggests that corruption will still thrive with higher wages and better working conditions without extensive and proper monitoring (Fjeldstad, 2005, 2003). In the presence of corruption, effective tax rates will be relatively low since firms can bribe tax administrators and get lower assessments or even pay tax administrators to avoid heavy penalties; this compromises firm growth and adds to the inefficiencies already created by taxation. Corruption in tax administration can also introduce measurement error in firms’ gross income, which could lead to biased estimates.. To minimize this problem, this chapter uses assignment to the large or the medium taxpayers’ office as instruments for gross income to reduce bias due to measurement error.

Finally, the focus on Uganda is driven by the availability of a non-public tax administration panel dataset and the need to generate evidence to contribute to the limited literature on empirical taxation in developing countries. The remaining sections of this chapter are organized as follows; Section 1.2 provides a conceptual framework; Section 1.3 discusses the empirical framework; Section 1.4 describes the data; Section 1.5 reports the results, and then conclusions are summarized in Section 1.6.

1.2 Conceptual Framework

There are two "main" hypotheses on the relationship between effective tax rates and firm size. The first hypothesis, proposed by Siegfried (1974), suggests that large firms have resources to influence political decisions in their favor and to hire tax experts who aide with tax planning, and hence are likely to face low effective tax rates. This is called the political power theory. Smaller firms, on the other hand, are resource-constrained and are likely to face high effective tax rates. The second hypothesis, proposed by Zimmerman (1983), suggests that large and successful firms are visible and will be subject to more scrutiny and regulation from tax administrators, hence they are likely to face high effective tax rates. This is known as the political cost theory.

To sharpen the discussion, the Effective Tax Rate (ETR) is defined as the ratio of Corporate Income Tax payments (CIT) over gross profits (π). Both of these variables are functions of gross income/receipts (x), which will be used as the measure of firm size, and the expenses incurred in generating that income.

Thus

$$ETR = \frac{corporate\ income\ tax\ payments}{gross\ profits}$$

$$= \frac{CIT(x)}{\pi(x)} \qquad (1.1)$$

Differentiating ETR in equation (1.1) with respect to x, results in the expression below;

$$\frac{dETR}{dx} = \left\{\frac{dCIT(x)}{dx}\frac{x}{CIT(x)}\frac{1}{\pi(x)}\frac{CIT(x)}{x} - \frac{d\pi(x)}{dx}\frac{x}{\pi(x)}\frac{CIT(x)}{\pi(x)}\frac{1}{x}\right\} \quad (1.2)$$

With some simplification, equation (1.1) can be expressed as

$$\frac{dETR}{dx} = \frac{CIT(x)}{x\pi(x)}\left\{\varepsilon_x^{CIT(x)} - \varepsilon_x^{\pi(x)}\right\} \quad = \frac{ETR(x)}{x}\left\{(\varepsilon_x^{CIT(x)} - \varepsilon_x^{\pi(x)}\right\} \quad (1.3)$$

where $\varepsilon_{\mathrm{x}}^{\mathrm{CIT(x)}}$ and $\varepsilon_x^{\pi(x)}$ are elasticities that capture the responsiveness of corporate income tax payments and gross profits, respectively, to changes in firm size (gross income/receipts).

Firms with positive profits but zero corporate income tax payments (firms exempt from the corporate tax by law) bear no corporate tax burden and for this reason they are excluded from the analysis. It is clear from equation (1.3) that firm size will have a positive effect on ETR if $\{\varepsilon_x^{CIT(x)} - \varepsilon_x^{\pi(x)}\} > 0$, which implies that larger firms are more visible, subject to more scrutiny from tax authorities, and likely to pay more in tax revenue. On the other hand, the effect is negative if $\{\varepsilon_x^{CIT(x)} - \varepsilon_x^{\pi(x)}\} < 0$; this implies that larger firms have the ability to under-report their profits or hire tax planners to minimize their tax liability, hence they are likely to face a lower tax burden. Clearly, there are two competing pressures, one that favors lower rates, and the other higher rates, for larger firms; the overall effect, therefore, depends on which effect is stronger, which cannot be determined by theory but rather is an empirical question. The next section discusses how the overall effect is estimated.

1.3 Empirical Framework

The effect of firm size on effective tax rates is estimated using a firm fixed-effects specification. The log of the effective tax rate is regressed on the log of gross income/receipts. Time-variant determinants of effective tax rates and firm fixed effects are then added to control for firm specific time-invariant characteristics. In addition, year-specific dummy variables are added to control for variables that change over time but affect all firms in the same way with respect to their taxes, such as changes in the macroeconomic environment. Evidence on the effect of firm size on effective tax rates from developing countries suggests a non-linear relationship (Mascagni and Mengistu, 2017; Carreras et al. 2017; Gauthier and Reinikka, 2006), hence higher-order terms of gross income/receipts are added to the extent that they are significant. The estimation equation is therefore given by equation (1.4):

$$lnY_{it} = \alpha_i + \eta_t + \delta_1 lnX_{it} + \delta_2 (lnX_{it})^2 + \delta_3 (lnX_{it})^3 + \boldsymbol{\beta'}_{\boldsymbol{i}} \boldsymbol{Z_{it}} + \mu_{it} \quad (1.4)$$

where;

Y_{it} is the effective tax rate for firm *i* at time *t;*

η_t are year-specific dummy variables;

X_{it} is gross income/receipts for firm *i* at time *t;* and

$\boldsymbol{Z}_{it}$ is a vector of other time-variant determinants of effective tax rates; and

α_i and μ_{it} are firm fixed effects and the residual for firm *i* at time *t*, respectively.

The variables in $\boldsymbol{Z}_{it}$ include: depreciation expenses, which captures the capital intensity of a firm; financial expenses, which capture a firm's leverage since interest payments are tax deductible while dividends are not; and before-tax profits, which is an indicator of firm profitability for tax purposes. If firms can use more allowable deductions as they get larger, then the before-tax profits will decrease with size. Except for before-tax profits, the coefficients on these other determinants of effective tax rates (depreciation and financial expenses) are expected to be negative because they are tax deductible expenses, and an increase in the amounts declared will reduce the corporate income tax payable, hence lower effective tax rates.

If the variation in effective tax rates is fully explained by the observed ability of firms to exploit the allowable deductions, which are denoted by $\boldsymbol{Z}_{t}$, then firm size should not have a significant effect on effective tax rates after adding these controls. However, there might be structural challenges that firms of different sizes face. In particular, small firms may not have enough collateral to allow them to borrow from formal banks but instead rely on quick yet expensive credit provided by informal "money lenders". Such financial expenses may not be deductible by the borrowing small firm for tax purposes since the lender cannot be traced by the tax authority, which means that such expenses are not part of the financial expenses captured in equation (1.4). If transactions between formal and informal firms are not part of the declared deductions, then firm size could

have a significant negative effect on effective tax rates even after controlling for expenses and before tax profits.

The outcome variable of interest is the effective tax rate (ETR), which is the share of a firm's accounting/gross profits spent on corporate income tax payments. As explained above, this variable is defined as the ratio of corporate income tax receipts/payments over accounting/gross profits, as shown in equation (1.1).

The choice of the numerator in equation (1.1) depends on the focus of the study, which in this case is the corporate income tax, thus only corporate income tax receipts/payments are included in the numerator. The analysis does not include income taxes on dividend payments even if some of the dividend recipients are corporations; including other taxes in the numerator broadens the research question beyond the scope of this study. Similar work done on Ugandan corporations by Gauthier and Reinikka (2006) included consumption taxes remitted by firms even if the burden falls directly on the consumer. Since the focus in this chapter is on corporate effective tax rates, only corporate income tax payments are included in the numerator of equation (1.1).

The choice of the denominator in equation (1.1) is discussed extensively in the literature since it may influence the direction of the relationship between ETR and firm size. However, using accounting/gross profits – defined as gross receipts less cost of

goods sold, which differs from before-tax profits/chargeable income since the latter does not include financial expenses, depreciation allowance, and any investment tax credits – as the denominator allows for the tax base to include all income before firms exploit the allowable deductions, such as interest payments, depreciation allowances and amortization of intangible assets (spreading the payment for an asset over time). Hence, constructing the ETR in this manner is appropriate for empirical research (Lazar, 2014). In addition, allowable deductions and other sources of income vary significantly across firms of different sizes: Thus, including all possible income in the denominator generates variation in effective tax rates which is essential for estimation.

The explanatory variable of interest is firm size, which is defined by the declared corporation's gross receipts (gross income). In this case, gross receipts also include income earned by firms that provide professional services, such as audit, accounting, financial and other consultative works that do not involve an actual sale of goods.

As shown in equation (1.4), the estimates in this chapter are based on a firm fixed-effects model because it is unrealistic to assume that firm-specific characteristics and changes in the macroeconomic environment are uncorrelated (purely random) with the unobserved determinants of effective tax rates.

If there are no other determinants of effective tax rates that are correlated with firm size, then estimating equation (1.4) without those variables, which are denoted by $\boldsymbol{Z}_{it}$, would give unbiased estimates. However, variables such as depreciation (which captures the capital intensity of a firm, and capital intensive firms are allowed to quickly deduct the value of capital before its economic life ends, which provides a tax saving), financial expenses (which capture the leverage of a firm, since interest payments are tax deductible while dividends are not), and before-tax profits, are correlated with firm size and affect effective tax rates. Excluding these variables will lead to omitted variable bias. Note that firm fixed-effects will not avoid the problem of omitted variable bias because the variables in $\boldsymbol{Z}_{it}$ change over time.

Uganda's corporate tax system is based on voluntary compliance, which means that firms voluntarily declare their income and the expenses incurred in generating that income. This may result in measurement error in the dependent variable of interest. It should be noted that measurement error in the dependent variable resulting from under declaration of gross profits is not a problem if it is not correlated with the explanatory variables of interest. However, this is unlikely because gross profits (the variable in the denominator of the dependent variable) are a function of gross income or receipts and the expenses incurred in generating that income. Indeed if there is measurement error in gross profits, it is likely to be negatively correlated with the main explanatory

variable, X_{it} which will lead to biased estimates of the impact of firm size, and the bias will be towards zero.

It should, however, be noted that tax declarations or returns in Uganda, are by law, considered accurate unless a tax audit reveals otherwise. If tax enforcement is very strict on firms that underreport, one cannot assert that firms are underreporting their accounting profits. What is more likely is that firms are involved in tax planning, which suggests tax avoidance "legally", reducing the tax liability, as opposed to illegally underreporting accounting profits. If firms are aggressively involved in tax planning (more tax avoidance than evasion) then reported accounting or gross profits are the same as actual profits, which may rule out measurement error in both the dependent variable and the explanatory variable, X_{it}. In addition, allowable deductions are very generous in Uganda, which makes it less likely that businesses will underreport their accounting or gross profits. What is more likely to happen is that firms will become creative in expensing income to minimize their tax liability. If firms in the Small Taxpayers Office (STO) indeed underreport their accounting profits, then they would face a lower tax burden. However, the effective tax rates may be higher for these small firms because of structural challenges, as will be discussed later in the chapter. Firms that underreport their accounting profits to stay in the STO, as opposed to being assigned to either the Medium or the Large Taxpayers Office (MTO or LTO), to avoid closer scrutiny from the tax authority may in fact be putting themselves at a tax disadvantage. The biggest concern,

therefore, is not with measurement error in the dependent variable–if there is, and it is purely random, then it will not lead to bias. Concerns of measurement error in the explanatory variable of interest are addressed in the following paragraphs.

Perhaps the econometric concern is that gross income might be measured with error, which if random leads to underestimation of the impact of gross income on the effective tax rates. Suppose that measurement error in the explanatory variable of interest, X_{it} in equation (1.4) is random, then dummy variables that equal 1 if a firm is assigned to either the Large or the Medium Taxpayers' Office (LTO or MTO) can be used as instruments for firm size. In addition to the instruments having predictive power for gross income (relevant instruments), the other identifying assumption is that the measurement error in the assignment of firms to the tax offices is not correlated with the measurement error in gross income (Angrist and Pischke, 2008). Note that it is preferable to use Instrumental Variables (IV) to estimate equation (1.4), but it is not possible because there are two instruments, to that effect, the higher order terms are dropped for the IV estimates.

Assignment to the large or the medium taxpayers' office acts as a signal to firms that the tax authority is watching, and that should induce firms to report correctly their income and the expenses incurred in generating that income. In general, it is difficult for firms to navigate tax matters because of the complexity of the tax system; having

dedicated offices to assist taxpayers with their tax concerns has some benefit that is appreciated by the business community. The tax authority decides which firms are to be allocated to either the Large or the Medium Taxpayers Office (LTO or MTO) and the rest of the businesses are part of the Small Taxpayers Office (STO).

The criterion for assigning firms to the tax offices depends on the main activity of a firm and gross sales reported by a firm. Sectors that require a large amount of initial capital investment that is later claimed as an allowable deduction when the firms start generating income (such as extractive industries, and telecommunication companies) are mainly classified as large taxpayers even when their gross sales are not at the threshold, and these firms cannot in any way misreport their main activity. In addition to the main activity, the tax authority sets a gross sales threshold not known to the taxpayers that is used to decide which firms are assigned to the LTO or the MTO or stay in the STO. It is difficult to manipulate a threshold that is not known. The thresholds are not public knowledge and are only known to the tax authorities. The tax authority on the other hand keeps a close watch, through regular desk audits, on LTO and MTO firms because they are important for tax revenue, which in itself increases the probability of detecting firms that were underreporting. Generally, increasing the probability of detection by scrutinizing more or showing the intent to scrutinize should influence firms to correctly report their income and related expenses (Allingham and Sandmo, 1972; Yitzhaki, 1974; Blumenthal et al, 2012).

The idea here is that assignment to LTO or MTO influences only the way firms report their income and related expenses because they are closely monitored by the tax authority, which in turn affects effective tax rates. There is no other possible way that assignment to LTO or MTO will affect the effective tax rates except by influencing the way firms report their incomes and related expenses. The treatment effect is assumed to be the same for all firms (Angrist and Pischke, 2008). Note that the Instrumental Variables approach will not reduce bias due to any measurement error that is not random. Measurement error could result from a deliberate effort by firms to underreport their gross income so as to minimize their tax liability, however, strict enforcement of that of the tax laws by the tax authority, coupled with high penalties in the Uganda' Income Tax Act might minimize underreporting by firms. This does not rule out the possibility that underreporting will exaggerate the effective tax rates. The estimation equations are:

First stage: $lnX_{it} = \alpha_s + \eta_t + \boldsymbol{\alpha_i D_i} + \beta_i Z_{it} + \upsilon_{it}$ (1.5)

Second stage: $lnY_{it} = \alpha_s + \eta_t + \delta \widehat{lnX}_{it} + \boldsymbol{\beta_i Z_{it}} + \mu_{it}$ (1.6)

Where;

Y_{it} is the effective tax rate for firm *i* at time *t;*

X_{it} is gross income/receipts for firm *i* at time *t*;

$\mathbf{Z_{it}}$ vector of other determinants of effective tax rates; depreciation, leverage and before tax profits/chargeable income;

η_t and α_s are year and sector-specific dummies respectively;

$\mathbf{D_i}$ is a vector of two dummy variables that equal to 1 if a firm is categorized as either LTO or MTO and 0 otherwise (the instruments).

Finally, data are observed over nine fiscal years. It is likely that the residuals in equation (1.4) are correlated over time for any given firm, which can lead to serial correlation. I, therefore, cluster the standard errors at the level of fixed effects in equation (1.4) i.e. at the firm level. The next section describes the data.

1.4 Data and Descriptive Statistics

The data used in the analysis are an unbalanced panel from Uganda's corporate income tax returns.[3] These data are an electronic version of the corporate tax returns of firms that are registered for taxes, which can be defined as formal firms. Formal firms are assigned by the tax authority to the Large, the Medium, or the Small Taxpayers' Offices (LTO, MTO, or STO) depending on their type of economic activity and/or their annual gross sales revenue. If a firm operates informally its income and related expenses are not in this dataset. Formal firms that transact with informal firms may have some of their expenses incurred in generating income disallowed by the tax administration since there is no third-party information to verify the transaction. Consequently, two formal firms may have different effective tax rates because one transacts with an informal firm and may have some of its expenses disallowed as deductions yet the other firm is allowed to

[3] These data are non-public; they are from the electronic returns filed with the Uganda Revenue Authority, which is Uganda's semi-autonomous agency responsible for tax collection.

deduct them for tax purposes. Tax administration data do not include informal firms because such firms are not known to the tax authority even though they exist and conduct transactions with formal firms. Table 1.1 below shows the Corporate Effective Tax Rates of Ugandan firms, constructed using equation (1.1).

Table 1.1: Corporate Effective Tax Rates (ETR) in Uganda

		ETR	
Fiscal Year	**Observations**	**Mean**	**Std. Dev.**
2009/10	4,426	3.3%	0.089
2010/11	7,229	3.1%	0.158
2011/12	9,608	3.5%	0.516
2012/13	11,348	4.0%	0.884
2013/14	13,417	3.6%	0.386
2014/15	13,698	3.1%	0.163
2015/16	16,623	10.4%	0.363
2016/17	16,094	10.4%	0.474
2017/18	15,741	11.3%	1.133
ALL	**108,184**	**6.7%**	**0.609**

Even though Uganda has a flat corporate tax rate of 30 percent, it is clear from Table 1.1 that the effective tax rate is much lower, about 6.7 percent on average. Indeed, the rate was as low as 3.3 percent in FY 2009/10, after which the effective tax rate increased by about 7.3 percentage points to 10.4 percent in FY 2015/16 and then to 11.3 percent as of FY 2017/18. The increase in the effective tax rate in recent years may be a result of the introduction of the public finance management act in the year 2015, which provided tax foresight to both businesses and the tax administrator. In addition, other tax policy reforms and improvements in tax administration may have played a role in the

increase in effective tax rates. Nonetheless, estimating the impact of the law change and recent tax policy reforms is not the focus in this chapter, but is under development for future work. These data cover nine fiscal years (FY), i.e. from FY 2009/10 to FY 2017/18. The entire dataset has 108,184 tax returns over the nine years; the number of returns in each fiscal year is shown in Table 1.2.

Table 1.2: Total Number of Corporate Income Returns

Fiscal Year	Number of returns	%	% of returns with a corporate income tax liability
2009/10	4,426	4.1%	49.4%
2010/11	7,229	6.7%	49.6%
2011/12	9,608	8.9%	50.2%
2012/13	11,348	10.5%	51.7%
2013/14	13,417	12.4%	54.7%
2014/15	13,698	12.7%	57.6%
2015/16	16,623	15.4%	59.7%
2016/17	16,094	14.9%	59.6%
2017/18	15,741	14.6%	61.5%
ALL	**108,184**	**100%**	

The numbers include 2,510 returns for partnerships. However, partnerships are pass-through entities; this means that income earned by such entities is taxed at the individual level. To that effect their effective corporate tax rate is zero and they are not included in the regression analysis undertaken in this chapter.

Table 1.2 shows that, on average over these nine years, about 54.9 percent of the firms in the dataset pay some corporate income tax, and that these firms have positive effective tax rates. Firms with zero effective tax rates are either exempt from the corporate income tax, or the income generated in a given year is offset by the expenses incurred in that year. However, the main interest in this chapter, as explained in the conceptual framework, is in firms that shoulder some burden of the corporate tax, hence

the analysis is based on 54,551 complete and non-zero returns. These returns include all firms in the Large, the Medium, and the Small Taxpayers' Offices whose return is complete and non-zero. The available data do not distinguish between firms that are exempt from corporate income tax and those that simply minimize their tax liability to zero – this is one of the limitations of the dataset.

The summary statistics, and a brief description of the variables from the 54,551 complete and non-zero returns, are presented in Table 1.12. It is important to note that accounting/gross profits refer to receipts from the sale of goods and services less the cost of the goods sold, and they differ from before tax profits/chargeable income since the latter does not include financial expenses, depreciation allowance, and any investment tax credits. A firm may have positive accounting profits but zero or negative chargeable income if its positive accounting profits are due to financial expenses, depreciation allowance, employee compensation or investment tax credits; such a firm will pay zero corporate taxes. All the variables are log-transformed because the main interest is estimating an elasticity that captures the responsiveness of effective corporate tax rates to changes in firm size while controlling for its other determinants. The next section discusses the results.

1.5 Results and Discussion

1.5.1 Gross Income as a Measure of Firm Size and ETRs

Table 1.3 shows results from a fixed effects (OLS) estimation as specified by equation (1.4) –without the higher-order terms. The results show the effect of firm size measured by log gross income on log ETRs. The estimates show the responsiveness of effective tax rates to changes in firm size, which are elasticities.

The results in column (1) of Table 1.3 are without firm fixed effects and any control variables, while column (2) includes only firm-level fixed effects. Specification (3) includes both firm-level fixed effects and year-specific dummies. Year specific dummies are then excluded in column (4), and only before tax profits are added as a control variable. Column (5) excludes year-specific dummies and adds depreciation allowance and financial expenses as control variables. Year-specific dummy variables and before tax profits are then included in column (6). Finally, column (7) includes firm-level fixed effects, year-specific dummies, and all the three control variables.

Table 1.3: Effect of Firm Size Measured by Gross Income on Effective Tax Rates

	Log Effective Tax Rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log gross income	0.089***	0.343***	0.033***	0.006	0.354***	-0.270***	-0.254***
	(0.005)	(0.016)	(0.013)	(0.017)	(0.016)	(0.014)	(0.014)
Log depreciation allowance					-0.006***		-0.020***
					(0.002)		(0.001)
Log financial expenses					-0.007***		-0.008***
					(0.002)		(0.002)
Log profits before tax				0.478***		0.449***	0.457***
				(0.015)		(0.014)	(0.014)
Year-specific dummies	No	No	Yes	No	No	Yes	Yes
Firm fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	54,551	54,551	54,551	54,551	54,551	54,551	54,551
R-squared	0.015	0.039	0.406	0.181	0.040	0.531	0.536
Number of clusters/firms		20,988	20,988	20,988	20,988	20,988	20,988

Robust standard errors in parentheses and are clustered at the firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. Adding interaction terms of Log gross income with all the control variables (Log before-tax profits, Log financial expenses, and Log depreciation expense) and interaction terms amongst control variables themselves to column (7) marginally reduced the effect of firm size on effective tax rates. The results suggest that a 10 percent increase in firm size leads to a 2.4 percent decrease in effective tax rates. The result is statistically significant at the 1 percent. Except for the coefficient on the interaction term between log gross income and log depreciation allowance that is significant at the 5 percent level, the rest of the interaction terms are not statistically significant. Regressions that include interaction terms are estimated for all the results in this chapter, and the results are very similar. These results are available from the author upon request.

Without any control variables, not even firm fixed effects or year-specific dummies, there is a positive correlation between effective tax rates and firm size of 0.089. Adding firm fixed effects only in column (2), increases the correlation to 0.343. With year-specific dummies added in specification, the effect greatly reduces to 0.033, although it is still slightly positive. All these conditional effects are statistically significant at the 1 percent level. Excluding the year-specific dummies and adding only firm profits (column (4)) reduces the conditional correlation to 0.006. This effect is not statistically significant. Column (5) shows that excluding the year-specific dummies and adding the depreciation allowance and financial expense variables, but excluding the before tax profits variable has little effect, relative to column (2), with a conditional correlation of 0.354. This result is statistically significant at the 1 percent level.

When year-specific dummy variables AND the before tax profits variable are included as shown in column (6) of Table 1.3, the conditional correlation becomes strongly negative. This result shows that a 10 percent increase in gross income is associated with 2.7 percent decrease in effective tax rates. Column (7) shows that, adding the depreciation allowance and financial allowance to column (6), marginally reduces the effect by 0.2 percentage points to 2.5 percent for a 10 percent increase in gross income. This result is highly statistically significant and precisely estimated with a 95% confidence interval between -0.226 and -0.282.

Recall that, year-specific dummy variables are added to control for variables that change over time but affect all firms in the same way with respect to their taxes, such as changes in the macroeconomic environment. In addition, these year-specific dummy variables account for the exogenous change in the ETRs resulting from the introduction of the public finance management law in 2015. Depreciation expenses are included to capture the capital intensity of a firm; financial expenses capture a firm's leverage since interest payments are tax deductible while dividends are not; and before-tax profits are added to capture the profitability of a firm for tax purposes. If indeed firm size does not matter, then including these control variables together with the year-specific dummies and firm-fixed effects should result in an insignificant effect of firm size on effective tax rates. However, the main results in column (7) of Table 1.3 suggest that conditional on these control variables, firm size still matters in Uganda. The possible explanation as to why that might be the case is explored later in this section.

1.5.2 Alternative Measures of Firm Size and ETRs

Table 1.4 shows estimates of equation (1.4), again without the higher-order terms, for alternative measures of firm size. The main purpose of this table is to check the robustness of the results of results in column (7) of Table 1.3 by using different measures of firm size.

Specification (1) of Table 1.4 shows results with the log of total employee compensation as a measure for firm size, constructed based on Davis, Haltiwanger, and Schuh (1996). Specification (2) uses a value added measure of firm size, which deducts the cost of goods sold from a firm's gross income, and specification (3) uses a two-year average of gross income as a measure for firm size, this measures adjusts for temporary increases or decreases in gross income in any given fiscal year.

Table 1.4: Effect of Alternative Measures of Firm Size on Effective Tax Rates

	Log Effective Tax Rate		
	(1)	(2)	(3)
Log total employee compensation	-0.235***		
	(0.013)		
Log value added by firm		-0.581***	
		(0.042)	
Two year average of log gross income			-0.076***
			(0.018)
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year specific dummies	Yes	Yes	Yes
Observations	39,370	54,551	32,248
R-squared	0.546	0.595	0.586
Number of clusters	15,071	20,988	12,261

Robust standard errors in parentheses and are clustered at the firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. The total employee compensation is constructed based on Davis, Haltiwanger and Schuh (1996) as $Size_{it} = \frac{1}{2} * (E_{it} + E_{it-1})$, which is the average size of firm i at time t; E_{it} and E_{it-1} are the total employee compensation by firm i at time periods t and $t-1$ respectively. Finally, the value added measure of firm size is the difference between total sales revenue and cost of goods of sold.

Specification (1) of Table 1.4 shows that a 10 percent increase in average total employee compensation is associated with a 2.35 percent decrease in effective tax rates. This result is significant at the 1 percent level, and it is only 0.19 percentage points less than the main result from Table 1.3 (column (7)) in absolute terms. In specification (2), a 10 percent increase in the value-added by a firm results in a 5.81 percent decrease in effective tax rates. This result is significant at the 1 percent level and is about double the magnitude of the main result from Table 1.3. This result implies that holding everything else constant, firms that add more value will tend to experience a much larger decrease in effective tax rate rates. Finally, the result from specification (3) in Table 1.4 shows that after adjusting for temporary increases or decreases in gross income, a 10 percent increase in the average gross income may induce a 0.76 percent decrease in effective tax rates. This result is significant at the 1 percent level. This result implies that the conditional effect of firm size on effective tax rates in much smaller in the long run. The results in both Table 1.3 and Table 1.4 suggest that conditional on the control variables, an increase in firm size is associated with a decrease in effective tax rates, and the result is robust to alternative measures of firm size.

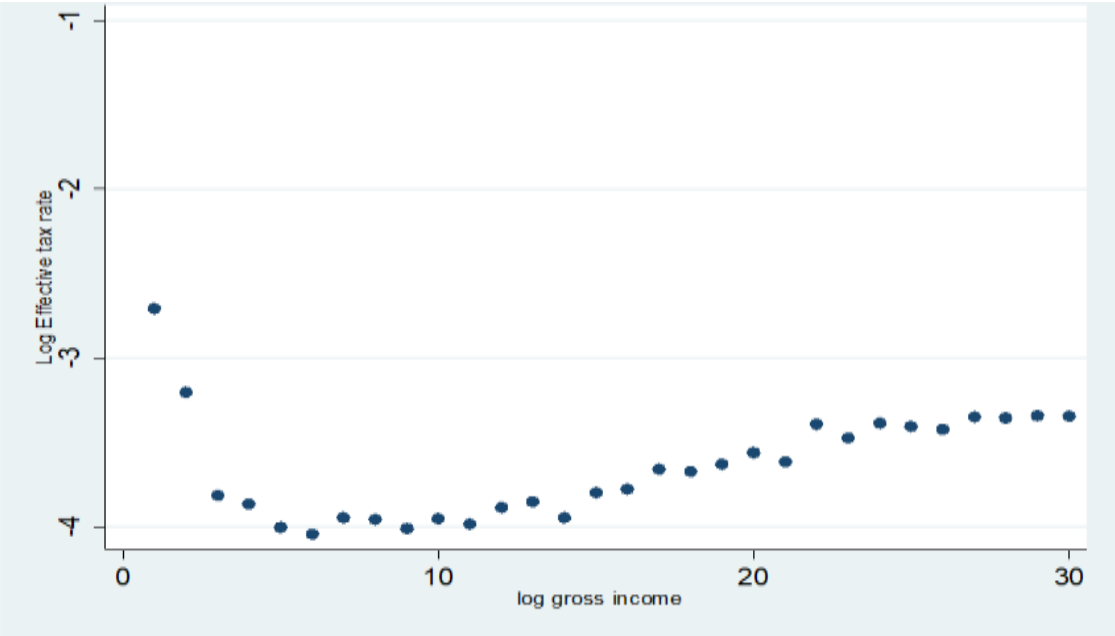
The main result from these two subsections, column (7) in Table 1.3, is robust to alternative measures of firm size. The result suggests that a 10 percent increase in firm size is associated with a 2.5 percent decrease in ETRs on average; the result is statistically significant at the 1 percent level and precisely estimated. If the variation in

effective tax rates were fully accounted for by differences in before tax profits/chargeable income and allowable deductions, then column (7) in Table 1.3 should result in an insignificant effect of firm size on the effective tax rate. However, that is not the case because there is likely to be variation in effective tax rates that arises from small formal firms transacting with informal firms, which is captured in the coefficient on firm size.

1.5.3 A Nonlinear Effect of Firm Size on Effective Tax Rates

As discussed in the previous subsection, the main result from Table 1.3 suggests a negative log-linear effect of firm size on ETRs. However, studies of effective tax rates in developing countries have found nonlinear effects, and some suggest a U-shaped relationship (Mascagni and Mengistu, 2017 and Carreras et al. 2017) while others suggest the inverse, that is, the middle firms shoulder the highest burden (Gauthier and Reinikka, 2006). In addition, a scatter plot of log effective tax rates (average) and log gross income suggests a non-linear relationship between effective tax rates and firm size, as shown in Figure 1.1.

Figure 1.1: A Scatter Plot of Average Log Effective Tax Rates and Log Gross Income



This figure suggests that the effect of firm size on effective tax rates is likely to be non-linear. The vertical axis shows the Average Effective tax rate and not the effect of expected value of log Effective Tax Rate for a given value of log gross income.

To parsimoniously but flexibly estimate this relationship, higher order terms of log gross income are added to equation (1.4) as long as they are significant. The results are presented in Table 1.5. Specification (2) in Table 1.5 adds a squared term of log gross income to the main result (specification (1)); the coefficient on this term is statistically significant at the 1 percent level. Specification (3) then adds a cubic term; and the linear, squared and cubic terms are all significant at the 1 percent level. This result provides evidence that supports a negative non-linear effect of firm size on effective tax rates in Uganda.

Table 1.5: Effect of Firm Size on Effective Tax Rates-Nonlinear Effects

	Log Effective Tax Rate		
	(1)	(2)	(3)
Log gross income	-0.254***	-0.712***	-6.597***
	(0.014)	(0.116)	(0.761)
Log gross income-squared		0.012***	0.309***
		(0.003)	(0.039)
Log gross income-cubed			-0.005***
			(0.001)
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year specific dummies	Yes	Yes	Yes
Observations	54,551	54,551	54,551
R-squared	0.536	0.537	0.539
Number of clusters	20,988	20,988	20,988

Robust standard errors in parentheses and are clustered at the firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses.

Figure 1.2 graphs specification (3) of Table 1.5 over the range of data with control variables evaluated at their means, this Figure shows that the effect is quite steeply negative for small firms but mostly flat in the middle range, and then becomes negative for large firms, which together with specification (1) are the main findings in this chapter.

Figure 1.2: Effect of Firm Size on Effective Tax Rates

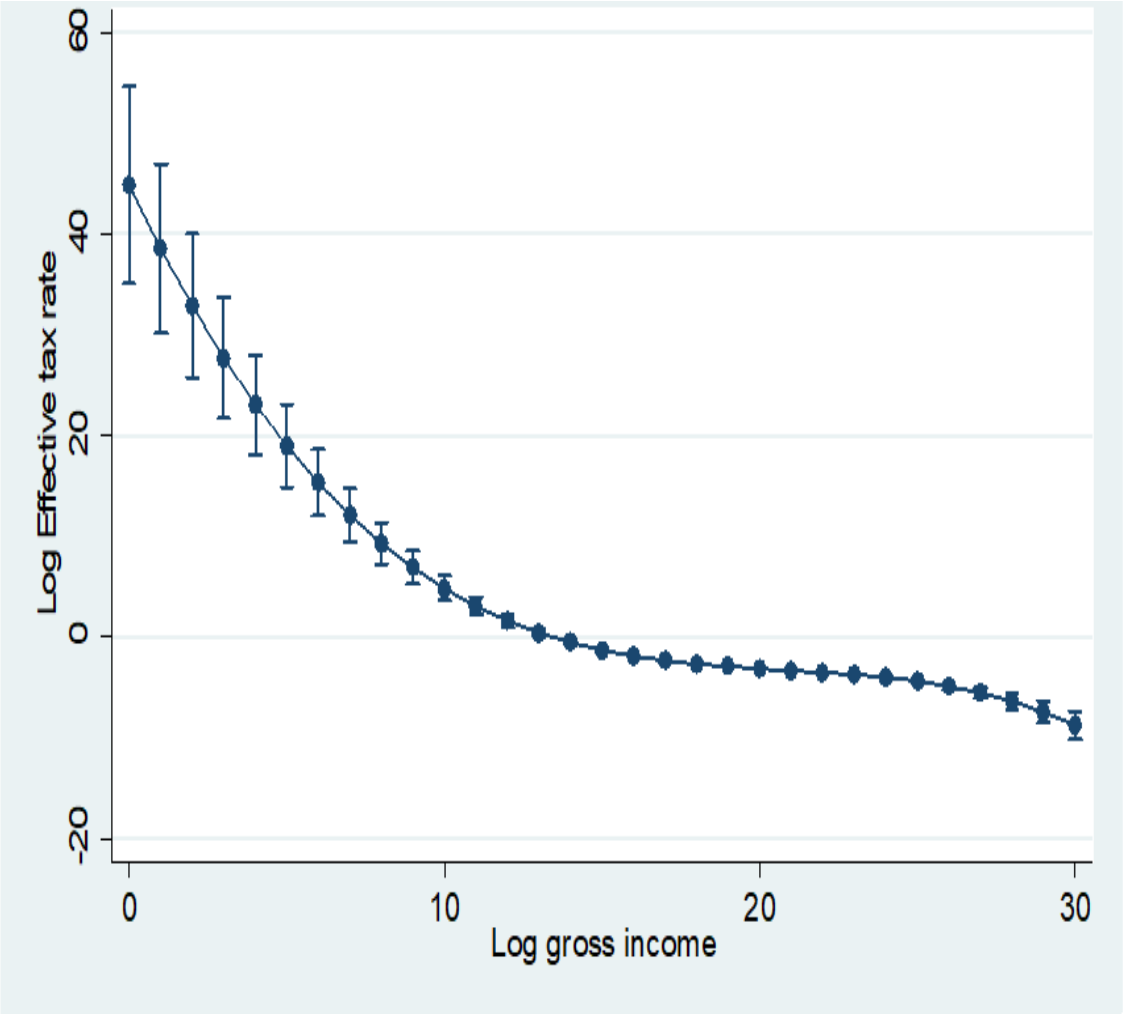


Figure 1.2 plots specification (3) in Table 1.5 over the range data.
The control variables are evaluated at their means, the figure also includes a 95% confidence interval, the confidence interval is wider for smaller and larger firms while most tight for medium-sized firms.

Given that the Public Finance Management Act (PFMA) was introduced in 2015, and that the average Effective Tax Rate increased by 7.3 percentage points from 3.1 percent in FY2014/15 to 10.4 percent in FY2015/16, the introduction of the PFMA might have changed how effective tax rates vary by firm size. To investigate this, the data are

divided into two time periods, pre-PFMA and post-PFMA, to check whether the effect of firm size on effective tax rates also changed. The results are in Table 1.6 and Table 1.7.

Table 1.6: Effect of Firm Size on Effective Tax Rates-Nonlinear Effects from FY 2009/10 to FY 2014/15 (Pre-PFMA)

	Log Effective Tax Rate		
	(1)	(2)	(3)
Log gross income	-0.210***	-0.728***	-8.294***
	(0.023)	(0.182)	(0.953)
Log gross income-squared		0.013***	0.400***
		(0.005)	(0.049)
Log gross income-cubed			-0.007***
			(0.001)
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year specific dummy	Yes	Yes	Yes
Observations	29,028	29,028	29,028
R-squared	0.223	0.225	0.231
Number of clusters	13,174	13,174	13,174

Robust standard errors in parentheses and are clustered at the firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. This Table is the same as Table 1.5, but it is for periods before the introduction of the Public Finance Management Act (PFMA) in 2015, which might have altered how effective tax rates change as firm size increases.

Table 1.7: Effect of Firm Size on Effective Tax Rates-Nonlinear Effects from FY 2015/16 to FY 2017/18 (Post-PFMA)

	Log Effective Tax Rate		
	(1)	(2)	(3)
Log gross income	-0.292***	-0.957***	-3.265***
	(0.021)	(0.154)	(1.236)
Log gross income-squared		0.017***	0.133**
		(0.004)	(0.063)
Log gross income-cubed			-0.002*
			(0.001)
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year specific dummies	Yes	Yes	Yes
Observations	25,523	25,523	25,523
R-squared	0.288	0.290	0.291
Number of clusters	14,552	14,552	14,552

Robust standard errors in parentheses and are clustered at a firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. This Table is the same as Table 1.5, but it is for periods after the introduction of the Public Finance Management Act (PFMA) in 2015, which might have altered how effective tax rates change as firm size increases.

As seen in specification (1) of both Table 1.6 and Table 1.7, a 10 percent increase in gross income is associated with a 2.1 percent and 2.9 percent decrease in effective tax rates, pre- and post-PFMA, respectively – which is a difference of 0.8 percentage points. These results are both statistically significant at the 1 percent level. The results from both the pre- and post-PFMA both support the existence of a non-linear relationship between firm size and effective tax rates. Figure 1.3, a graph of specification (3) from both Table 1.6 and Table 1.7, suggests that, relative to the pre-PFMA period, the effect in the post-PFMA period is less-steeply negative for smaller firms and then mostly flat for the

middle range and large firms. Figure 1.3, therefore, suggests that the introduction of the PFMA in 2015 might have altered the effect of firm size on effective tax rates in ways that attempt to equalize the effective tax rates across all firms.

Figure 1.3: Effect of Firm Size on Effective Tax Rates

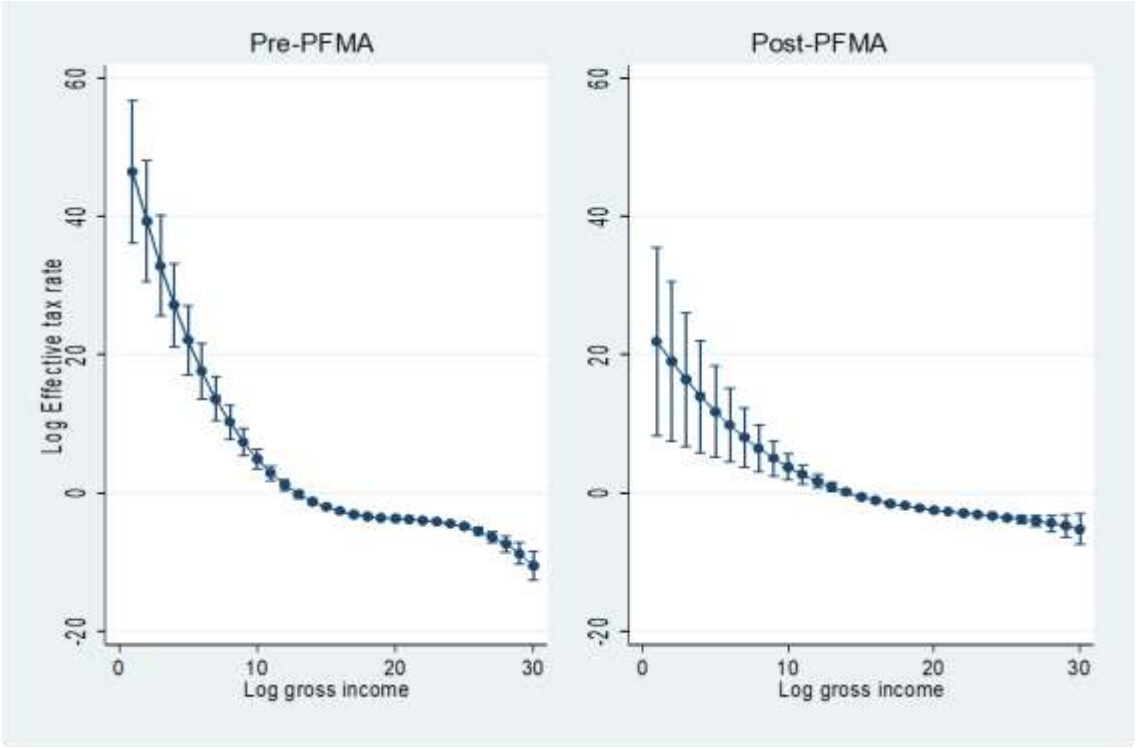


Figure 1.3 shows the relationship between Firm Size and Effective Tax Rates, before and after the Public Finance Management Act (PFMA) was introduced in Uganda in 2015. This figure is a plot of specifications (3).from Table 1.12 and Table 1.13. The control variables are evaluated at their means, the figure also includes a 95% confidence interval, the confidence interval is wider for smaller firms while most tight for medium and large-sized firms.

The negative effects discussed in this chapter so far suggest that the responsiveness of corporate income tax payments to changes in firm size is less than the responsiveness of corporate profits to changes in size, which points to the ability of larger firms to hire tax planners to minimize their tax liability. The non-linearity of the effects

points to differences in access to tax information and in the ability to interpret the tax law by firms of different sizes. Given that smaller firms face resource constraints and may not be able to afford the services of a tax planner, it is likely that they are at a tax disadvantage. On the other hand, the tax law might be very complicated and subject to multiple interpretations by both the tax authority and businesses, which allows room for misreporting of income and related expenses. Based on the findings in this chapter, one can argue that the corporate tax regime is regressive in gross income, but it should be noted that the corporate tax rate is 30 percent regardless of size, and the allowable deductions are accessible to all eligible firms. The results, therefore, suggest that the tax law might be complicated for small businesses, or that the gaps in both tax policy and administration are being exploited more aggressively by large firms.

Given that the results include controls such as financial expenses, depreciation allowance, and profitability for tax purposes (before-tax profits), if indeed these controls account for the differences in effective tax rates, then firm size should not have a significant effect on effective tax rates. But, holding these variables constant there is still a significant negative effect of firm size on effective tax rates; this suggests that there is variation in effective tax rates as a result of the informality of the overall economy. It is also possible that labor expenses could be the only remaining source of variation; these

labor expenses were also added to specification (1) of Table 1.5 and the instrumental variable results in Table 1.9, and the negative effects persisted in both cases.[4]

A possible explanation for the significant negative effect is that the nature of operations that small formal firms are involved in might involve working with informal firms, which puts them at a tax disadvantage. For example, smaller firms are more likely to rely on "money lenders" for quick yet expensive credit. Since money lenders operate informally, the tax authority is likely to disallow any interest payments to them because they cannot be traced; this implies that two formal firms may have different effective tax rates because one transacts with an informal firm and may have some of its expenses disallowed as deductions, yet the other firm is allowed to deduct all its expenses. To that effect, informality is likely to be costly for smaller formal businesses that choose to work with informal firms.

In contrast, larger firms have collateral and can borrow from formal institutions, thus deducting the interest paid on such credit and thereby gaining a tax advantage. This, therefore, implies that the level of informality in the Ugandan economy and other developing countries puts small formal businesses at a tax disadvantage. It should be noted that the tax system is not designed to put smaller firms at a tax disadvantage, but improvements could be made to account for the structural challenges within the economy such as providing a relatively lower tax rate for small businesses and also minimizing the

[4] The results are presented in Table 1.13

number of allowable deductions. Such changes may correct for some of the unintended effects of the corporate tax design on small businesses and encourage other informal businesses to formalize their operations.

1.5.4 Robustness checks

Instrumental Variables (IVs) and Median Regression Estimates

As discussed in the empirical framework, firm assignment to the large or the medium tax office is used to generate instruments that can be used to reduce bias due to any random measurement error in gross income and buttress the main results in this chapter. The results from the first stage are presented in specification (1) of Table 1.8; both the instruments have a positive and statistically significant effect on gross income. This means that the instruments have predictive power for gross income beyond what the other variables in the regression have. The F-statistic is 1101.59 and is highly significant (last row in Table 1.9), which demonstrates that the instrument is strong. The second stage results are presented in Table 1.9, and specification (1) shows that the "causal" effect of firm size on effective tax rates is indeed negative. The results show that a 10 percent increase in firm size will likely result in a 3.2 percent decrease in effective tax rates. The result in Table 1.9 is very close to the main result from the last column of Table 1.3, and therefore, buttresses the main results discussed at the beginning of this section.

Table 1.8: First-stage Instrumental Variables (IV) Estimates

	Log gross income
	(1)
Firm assigned to the Large Taxpayers' Office	2.323***
	(0.061)
Firm assigned to the Medium Taxpayers' Office	1.600***
	(0.033)
Controls	Yes
Year specific dummy	Yes
Sector-specific dummy	Yes
Observations	54,551
R-squared	0.651

Robust standard errors in parentheses and are clustered at the firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. Firm assignment to the large or the medium tax offices are used as instruments for Log gross income.

Table 1.9: IV Estimates Second-stage

	Log Effective Tax Rate
	(1)
Log gross income	-0.315***
	(0.015)
Controls	Yes
Year specific dummy	Yes
Sector-specific dummy	Yes
Observations	54,551
R-squared	0.500
First stage partial R-squared	0.1591
First stage F-statistic	1101.59

Robust standard errors in parentheses and are clustered at the firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. The instrumented variable is Log gross income and the instruments are dummy variables for firms assigned to the large or the medium tax offices.

As shown earlier in Figure 1.1, there might be outliers that result from random measurement error in gross income, to minimize the influence of outliers on the conclusions drawn in this chapter, a median regression was used. The results are shown in Table 1.10.

Table 1.10: The Effect of Firm Size Measured by Gross Income on Effective Tax Rates using a Median Regression

	Log Effective Tax Rate		
	(1)	(2)	(3)
Log gross income	-0.275***	-0.101**	-5.878***
	(0.004)	(0.046)	(0.333)
Log gross income-squared		-0.004***	0.280***
		(0.001)	(0.017)
Log gross income-cubed			-0.005***
			(0.000)
Controls	Yes	Yes	Yes
Year-specific dummies	Yes	Yes	Yes
Sector-specific dummies	Yes	Yes	Yes
Observations	54,551	54,551	54,551

Bootstrapped standard errors in parentheses ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses.

Table 1.10 shows that the results support a negative and non-linear effect of firm size on effective tax rates. The results are statistically significant at the 1 percent level. In addition, results for the alternative measures of firm size are presented in Table 1.14, and the results are slightly larger in magnitude relative to the results in Table 1.5. Still, they all show a negative effect of firm size on effective tax rates. These results, therefore, suggest that the main results in this chapter are robust to outliers, and that the random

measurement error in gross income may not be very pronounced as earlier anticipated. Note that most empirical taxation research that the author is aware of from developing countries may acknowledge problems associated with random measurement error but the existing research does very little to address any of these problems. Assuming that the government of Uganda makes the thresholds for assigning firms to the large and the medium taxpayers' office public, this will present an opportunity for future research that analyzes the behavior of firms at these thresholds. One can then check whether firms with gross incomes close to the thresholds underreport to avoid scrutiny from the tax authorities.

Finally, there may still be problems if the process of assigning firms to large or medium taxpayers' offices is subject to measurement errors that are correlated with the measurement error in gross income; if that happens, then the IV estimates will be inconsistent. One way that the process of assigning firms to LTO or MTO might be subject to measurement error is that increased scrutiny from the tax authority for firms assigned to Large or Medium taxpayers' offices might result in bunching at the cutoffs. Firms just slightly above the cutoff might underreport their gross income to avoid scrutiny from the tax authority (Almunia and Lopez-Rodriguez, 2018). However, in Almunia and Lopez-Rodriguez (2018), the cutoffs are public knowledge which is not the case in Uganda; it is difficult to manipulate a cutoff that is unknown.

While exercising appropriate caution when drawing causal conclusions, an increase in gross income does not automatically cause the effective tax rate to decrease. It is what firms do with the increase in gross income that might lead to a decrease in effective tax rates. When gross income increases, firms are likely to hire more workers, which means an increase in employee compensation, firms may automate some of their operations or invest in capital assets – this results in an increase in the depreciation allowance, firms may borrow more formally with their increased size – have enough collateral, which increases their interest deductions, and firms are also likely to invest in research and development. These actions will result in an increase in total allowable deductions, which should reduce a firm's effective tax rate for a given level of gross income. Holding everything else constant, an increase in allowable deductions will lead to a decrease in effective tax rates. To test some of these channels, total allowable deductions and its subcomponents, such as depreciation allowance, financial expenses and employee compensation, are regressed on gross income. The effects from the fixed effects and instrumental variable estimations are shown in Table 1.11 and Table 1.15 respectively.

Table 1.11: Fixed Effects Estimates of Impact of Gross Income on Allowable Deductions

	(1) Log total allowable deductions	(2) Log depreciation allowance	(3) Log financial expenses	(4) Log employee compensation
Log gross income	0.310***	0.733***	0.790***	0.425***
	(0.018)	(0.049)	(0.041)	(0.012)
Firm fixed effects	Yes	Yes	Yes	Yes
Year-specific dummies	Yes	Yes	Yes	Yes
Observations	43,279	54,551	54,551	54,540
R-squared	0.053	0.021	0.028	0.289
Number of clusters	16,198	20,988	20,988	20,985

Robust standard errors in parentheses: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively.

Table 1.11 shows that gross income has a positive effect on all four variables. This provides evidence that it is the increase in these allowable deductions as gross income increases that may lead to a decrease in effective tax rates. However, the elasticities in Table 1.11 are expected to be larger than 1 since larger firms have the ability to exploit the allowable deductions which consequently reduces their effective tax rates. This means that the allowable deductions as a proportion of gross income should increase as firms get larger. The fact that the elasticities are less than 1 in Table 1.11 suggests that allowable deductions as a proportion of gross income are decreasing as firms get larger. This may reflect random measurement error in gross income. Using dummy variables for firms assigned to the large and the medium tax offices as

instruments for gross income, some of the elasticities are more than 1 as shown in Table 1.15, which is as expected.

Note that firms that incur any of these expenses and any other allowable deductions in Uganda, and do not claim them as tax deductions for corporate income tax purposes may face an increase in effective tax rates as gross income increases. This may happen because the corporate income tax is complex. Small firms may also lack tax information or the ability to interpret it. To test some of these claims and what they mean for tax compliance in sub-Saharan Africa, tax authorities may consider implanting tax information campaigns targeted towards small firms, and assess how these firms respond to the tax information. The next section provides concluding remarks.

1.6 Conclusion

Tax policies in developing countries are usually designed to mirror those in developed economies, but challenges with informality, poor governance, high cost of tax compliance and low tax morale tend to influence firm decisions in response to changes in tax policy. The focus in this chapter was to estimate the effect of firm size on effective tax rates and assess the progressivity of the corporate tax regime regarding business income. The results suggest a negative effect of firm size on effective tax rates. On average, a 10 percent increase in firm size leads to a 2.5 to 3.2 percent decrease in

effective tax rates; this negative effect is not driven by measurement error and is robust to both alternative measures of firm size and outliers. In addition, there is evidence that supports a non-linear effect, the effect is quite steeply negative for small firms but mostly flat in the middle range, and then becomes negative again for large firms.

Even though the tax system is not designed to disadvantage smaller firms, the results suggest that these firms face a relatively higher tax burden, which is a disincentive to other informal small businesses to formalize their operations. To that effect, improvements can be made to the income tax law to account for structural challenges that small firms face by lowering their corporate tax rate. At the same time, provisions to minimize the number of deductions that large firms take should be put in place to correct for some of the unintended effects of the corporate tax design on smaller businesses.

On the tax administration front, tax clinics could be put in place to provide information to firms that cannot otherwise afford the services of tax accountants. The effects of such tax clinics on tax compliance should be evaluated in future research. These interventions will not only encourage informal smaller businesses to become formal – which should widen the tax base – but will also ensure that larger firms pay a fair amount of their corporate profits in taxes. It should be noted that informality is a challenge for most developing countries, and the results in this chapter may not necessarily hold if most informal firms formalized their operations. In general, corporations do not pay taxes, instead people do; the research in this chapter does not cover the distributional effects of the corporate

income tax on individuals in Uganda; this is another area for potential future research and it will reveal the economic incidence of an income tax in Uganda.

Table 1.12: Summary Statistics and a Brief Description of the Data

Variable	Description		Mean	Std. Dev.	Min	Max	Observations
log Effective Tax Rate	The variable is the logged shared of income spent on corporate income tax payments	overall	-3.05	1.480	-21.32	4.92	N = 54551
		between		1.390	-19.33	3.35	n = 20988
		within		0.843	-16.88	3.84	
log gross income	The logged amount of money that Ugandan corporations derive from the sale of goods or/or provision of services	overall	19.74	2.068	11.70	28.24	N = 54551
		between		1.893	12.90	27.95	n = 20988
		within		0.487	12.36	23.63	
Log financial expense	This category of include expenses of a financial nature incurred in generating income i.e. Interest expenses, Bank Charges, Insurance, exchange rate losses, provision for bad debts	overall	12.14	5.948	0	25.54	N = 54551
		between		5.863	0	25.54	n = 20988
		within		2.425	-7.17	33.86	
Log depreciation expense	The estimated loss in value of capital equipment (wear and tear) at the end of every fiscal year is captured by this variable	overall	11.40	6.936	0	25.85	N = 54551
		between		6.845	0	25.48	n = 20988
		within		2.997	-6.610	27.346	

Log average employee compensation	This an alternative measure of firm size constructed as the average of employee compensation in two successive years	overall		16.77	1.771	10.34	25.70	N = 39370
		between			1.625	11.54	25.42	n = 15071
		within			0.402	13.09	21.14	
Log Value Added	This variable is an alternative measure of firm size; it is constructed by deducting the cost of goods sold from a firm's gross income.	overall	18.43		1.703	0	28.05	
		between			1.554	10.71	27.94	
		within			0.474	0.40	22.00	N = 54551
								n = 20988
Two year average of log gross income	This Variable is a two-year average of gross income. The main objective of this variable is to adjust for temporary increases or decreases in gross income over time.	overall		20.04	2.037	13.83	28.14	N = 38354
		between			1.901	13.83	27.97	n = 14880
		within			0.306	14.38	23.41	
log of before tax profit	This variable captures the before tax profit after adjusting the gross profits for expenses incurred in generating income and any other allowable deductions	overall		16.25	2.129	0	26.79	N = 54551
		between			1.957	0	26.79	n = 20988
		within			0.748	1.46	23.94	

These variables were constructed from the electronic corporate income tax returns data from the Uganda Revenue Authority. Uganda's tax regime is a voluntary compliance regime, implying that businesses voluntarily declare the income earned and the expenses incurred in generating that income for a given fiscal year. These data are considered final after the initial checks to ensure consistency unless a tax audit proves otherwise. It should also be noted that expenses above Uganda Shillings 5million (about USD 1,350) in one transaction cannot be allowed as deductions without providing the tax identification number of the suppliers.[5] To get a feel of what the raw numbers look like one has to take the exponents of the numbers. The statistics are logged because we use the log-transformed numbers in the estimation.

[5] Subsection 22(2m) of Uganda's Income Tax Act Cap. 340

Table 1.13: Fixed Effects and IV Estimates with Employee Compensation added as Controls

	Log Effective Tax Rate	
	(FE)	(IV)
Log gross income	-0.175***	-0.084***
	(0.015)	(0.018)
Log depreciation allowance	-0.019***	-0.022***
	(0.001)	(0.001)
Log financial expenses	-0.007***	-0.006***
	(0.002)	(0.001)
Log profits before tax	0.460***	0.543***
	(0.014)	(0.010)
Log employee compensation	-0.193***	-0.296***
	(0.009)	(0.010)
Controls	Yes	Yes
Firm fixed effects	Yes	No
Year specific dummy	Yes	Yes
Sector specific dummy	No	Yes
Observations	54,540	54,540
R-squared	0.547	0.549
Number of clusters	20,985	

Robust standard errors in parentheses: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. The results in column (IV) use firm allocation to large/medium taxpayers' office as an instrument for Log gross income.

Table 1.14: Median Regression and Alternative Measures of Firm Size

	Log Effective Tax Rate			
	(1)	(2)	(3)	(4)
Log gross income	-0.275***			
	(0.004)			
Log total employee compensation		-0.398***		
		(0.005)		
Log value added by firm			-0.962***	
			(0.002)	
Two year average of log gross income				-0.202***
				(0.006)
Controls	Yes	Yes	Yes	Yes
Year-specific dummies	Yes	Yes	Yes	Yes
Sector-specific dummies	Yes	Yes	Yes	Yes
Observations	54,551	39,370	54,551	32,248

Bootstrapped standard errors in parentheses ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables/other determinants of ETRs include: Log before tax profits/chargeable income, Log financial expenses, and Log depreciation expenses. The total employee compensation is constructed based on Davis, Haltiwanger and Schuh (1996) as $Size_{it} = \frac{1}{2} * (E_{it} + E_{it-1})$, which is the average size of firm i at time t; $E_{it}\ and\ E_{it-1}$ are the total employee compensation by firm i at time periods $t\ and\ t-1$ respectively. The two year average of log gross income is constructed in a similar way. Finally, the value added measure of firm size is the difference between total sales revenue and cost of goods of sold.

Table 1.15: IV Estimates of Impact of Gross Income on Allowable Deductions

	(1) Log total allowable deductions	(2) Log depreciation allowance	(3) Log financial expenses	(4) Log employee compensation
Log gross income	0.889***	1.459***	1.528***	0.785***
	(0.017)	(0.030)	(0.026)	(0.011)
Year specific dummies	Yes	Yes	Yes	Yes
Sector-specific dummies	Yes	Yes	Yes	Yes
Observations	43,279	54,551	54,551	54,540
R-squared	0.419	0.172	0.255	0.569

Robust standard errors in parentheses: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The instrumented variable is Log gross income and the instruments are dummy variables for firms assigned to the large or the medium tax offices.

Table 1.16 Effect of Firm Size on Effective Tax Rates (Alternative Specifications)

	Log effective tax rates		
	(1)	(2)	(3)
Log gross income	0.144***	-0.175	-5.572***
	(0.004)	(0.112)	(0.738)
Log gross income squared		0.007**	0.280***
		(0.003)	(0.037)
Log gross income cubed			-0.005***
			(0.001)
Log depreciation allowance ratio	-0.481***	-0.403***	-0.400***
	(0.018)	(0.026)	(0.026)
Log financial expenses ratio	-0.240***	-0.136***	-0.135***
	(0.021)	(0.031)	(0.031)
Log before tax profits ratio	9.457***	8.981***	8.936***
	(0.200)	(0.292)	(0.291)
Year-specific dummies	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	54,551	54,551	54,551
R-squared	0.536	0.537	0.539
Number of clusters/firms	20,988	20,988	20,988

Robust standard errors in parentheses ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables in this table are expressed as ratios of log gross income. This is an alternative specification, the linear estimate in specification (1) changes the sign and this will be explored in more detail before submitting this chapter to an academic journal

Chapter 2

The Impact of Changes in Excise Tax Rates on Firm Sales Revenue, Firm Profits and Government Tax Revenue in Uganda

2.1 Introduction

A staunch smoker will give anything for a good puff, and the government knows it. To that effect, governments tend to explore every opportunity to increase tax rates payable on products such as cigarettes that have a relatively inelastic demand (Ramsey, 1927; Mankiw et al., 2009). However, it is unclear whether the goods that governments perceive to have inelastic demand are actually inelastic in demand. Governments can continue to increase tax rates on such products to the extent that their demand becomes elastic (Callison and Kaestner, 2014). The primary goal of this chapter is to estimate the impact of changes in excise tax rates in Financial Year 2015/16 on firms' sales revenue, profits, and government excise tax revenue in Uganda.

In many developing countries, timelines for a budget cycle are documented in some form of legislation. Still, it is not clear when proposed tax legislation will become law since the approval processes may take a long time. Clear and adhered to timelines in a budget process tend to allow for predictability and reduce uncertainty for both firms – regarding what taxes they will face the next fiscal year – and the tax administration – in terms of focusing their tax enforcement efforts. On the other hand, certainty with regard to future taxes may undermine a tax policy change's effectiveness since firms and individuals may alter their behavior in anticipation of the tax change. Firms may also aggressively lobby against the tax change, and influence the legislature's decisions, hence undermining the revenue effort.

Traditionally, excise tax rates have been limited in the scope of their imposition. Such tax rates' main objective was to correct for market failures such as negative externalities associated with the production or consumption of goods such as cigarettes, alcohol, and petroleum products, among others. An externality arises when the actions of one party make another party worse off (private marginal benefit is less than social marginal cost) or better off (marginal social benefit exceeds private marginal cost) without any form of compensation (Coase, 1960; Meade, 1952). Under the assumption that markets would have otherwise been perfect, for negative externalities the government imposes a "Pigouvian tax" equivalent to the marginal social cost incurred by the affected party (Baumol et al., 1988; Laffont, 1988; Gruber, 2005). In practice, however, excise taxes in developing countries have turned out to be a convenient way to generate government revenue; this is because such taxes are relatively easy to administer, and the targeted products tend to be relatively inelastic in demand (Ramsey, 1927; Bolnick and Haughton, 1998; Hines, 2007). On the other hand, the demand for such goods might be relatively elastic. Also, businesses and consumers may respond to an increase in an excise tax by involving themselves in illicit trade or buying the same good in an alternative nearby low tax jurisdiction (Callison and Kaestner, 2014). Such behavior by both businesses and consumers suggests that goods which are perceived to be inelastic in demand may be elastic when tax rates are increased beyond what is optimal.

In Uganda, the scope of excisable goods – that is, the goods that attract excise taxes – has increased significantly over the years beyond just cigarettes, alcoholic beverages, and petroleum products. The list of excisable goods also includes: cement, furniture, confectionaries (sweets, chewing gum, and chocolates), bottled drinking water and nonalcoholic beverages (sodas and juices), motor vehicle lubricants, cosmetics and perfumes, sugar, and cooking oils. All of these products, and their respective excise tax rates, are listed in the second schedule of Uganda's Excise Duty Act of 2014 and its subsequent amendments. In the process of widening the scope of excisable goods to raise revenue, Ugandan policymakers might be constraining firm output, which may discourage new investment and firm growth. The findings in this chapter are intended to inform policymakers in Uganda and other developing countries that, while tax revenues might increase only marginally in response to an increase in an excise tax rate, firms' sales revenue and profits may significantly decline. In addition, governments may consider using excise taxes for purposes of only limiting consumption rather than using them as a convenient way to raise government revenue. Governments may explore other tax types such as the Value Added Tax or the Personal Income Tax for purposes of generating tax revenues.

Excisable goods in Uganda are subject to different tax rates, some of which are specific; that is, a firm is required to pay a specific amount of tax per unit of output supplied. Others are ad-valorem rates, which are a particular percentage of the product's

ex-factory price - the selling price of a product less any incidental costs incurred in delivering that product to a consumer. The specific rates are somewhat easier for tax administrators to enforce than ad-valorem because the former is based on output alone. Nonetheless, specific tax rates are not responsive to temporary changes in price, which provides lower tax revenue, relative to an ad-valorem tax, whenever prices increase.

A final important issue is that, under a voluntary tax system, where firms voluntarily report their production numbers, businesses might respond to either type of tax by under-reporting production. Under-reporting is more likely to occur when the tax administrator's probability of detecting such acts is very low, so that the benefits to the business of under-reporting exceed the expected penalties (Allingham and Sandmo, 1972; Yitzhaki, 1974; Blumenthal et al., 2012).

To protect the expected tax revenue from temporary price shocks, policymakers in developing countries tend to design a "hybrid" regime with both specific and ad-valorem rates, and charging the higher of the two rates after the tax authority assesses the amount of tax that is due. This might minimize tax revenue leakages from the tax policy side, but the tax regime's efficiency in raising the required excise tax revenue at the lowest possible compliance cost will depend on the tax administration's ability to track and trace firms' production and sales revenues.

As partly alluded to above, excise taxes can be viewed as taxes on production since they are charged per unit of output; for example, Uganda charges shillings 45,000 per one thousand sticks of cigarettes produced.[6] Firms are likely to respond to an increase in tax rates either by transferring the entire tax to the consumer through increased prices or by shouldering some of the burden themselves, depending on their market power. If firms have some market power and can transfer the entire tax burden onto the consumer, firm profits will not be responsive to tax changes. On the other hand, if firms have to shoulder some of that burden, profits will decrease in response to an increase in the excise tax.

In addition, introducing a tax that is not a lump-sum is generally associated with deadweight loss; this means that with a tax increase, the equilibrium level of output will be lower than it would have been otherwise. With a broad scope of excisable goods in Uganda, driven mainly by the need to increase revenue, policymakers should focus not only on tax revenue but also on the implications of tax policy changes for firms' sales revenue and profits. The evidence presented in this chapter suggests that increases in excise tax rates may not result in any increase in government revenues, but rather have significant negative effects on firms' sales revenue and firm profits. The evidence

[6] This was the rate of tax that was applied to soft cup cigarettes in Fiscal Year 2015/16. At an exchange rate of USD 1 to Shs. 3,700, this particular rate of tax is equivalent to about USD 12.16 per 1,000 sticks of soft cup cigarettes produced or supplied. The rate was gradually increased in Fiscal Years 2016/17 and 2017/8 to about USD 14.9. The details of the changes can be found in Uganda's excise duty amendment acts of the corresponding year.

generated in this chapter contributes to the scarce literature on empirical taxation in developing countries. It estimates the effects of increases in excise tax rates on firms' sales revenue, profits, and government excise tax revenues.

The remaining sections of this chapter are organized as follows; Section 2.2 provides a background; Section 2.3 provides a conceptual framework; Section 2.4 describes the data; Section 2.5 discusses the empirical strategy; Section 2.6 reports the results, and conclusions are summarized in Section 2.7.

2.2 Background

In 2015, the Ugandan government replaced the Budget Act of 2001 with the Public Finance Management Act (PFMA). The PFMA altered the timelines for the budget process by requiring proposed changes to tax policy and expenditure plans for the next fiscal year to be presented to the Ugandan Parliament by 1st April instead of the end of June. The proposed changes, in either case, become effective on 1st July. Under the old regime, firms and individuals had very little knowledge of what changes they can expect until the last day of the fiscal year (30th June). There was still uncertainty beyond 30th June because the Ugandan Parliament had to discuss and pass the proposed changes. The bills were sent to the president for signature before becoming law. This process could sometimes drag on for up to four months in the new fiscal year. During the

transition, the government collected tax revenue with the revised tax rates regardless of whether the changes had been approved, using the Provisional Collection Order. With the old regime, there was a large amount of uncertainty for businesses and a risk to the government's revenue effort if the proposed changes were not approved.

Another change that occurred at the same time, which is particularly relevant for the purposes of this chapter, is that, in Fiscal Year 2015/16, the Ugandan government increased excise tax rates on cigarettes, beer, wine, fuels, motor vehicle lubricants, confectionaries, and furniture. The details of these changes are presented in Table 2.1.

Table 2.1 Average Excise Tax Rates

Product	FY2014/15 (Baseline)	FY2015/16 (One Year After Baseline)	FY2016/17 (Two Years After Baseline)
Cigarettes (Uganda Shillings)	52,000	60,000	65,000
Fuels/Gasoline (Uganda Shillings)	608	628	668
Cigars (percent)	160%	200%	200%
Beer (percent)	40%	45%	45%
Wine (percent)	45%	50%	50%
Motor Vehicle Lubricants (percent)	0%	5%	10%
Confectionaries (percent)	0%	10%	20%
Furniture (percent)	0%	10%	3%
Un-denatured Spirits (percent)	140%	100%	100%

The excise tax rates in this table are averages for products that have multiple rates such as cigarettes, beer and fuels. The rates for cigarettes are per 1,000 sticks and fuel is per liter, these rates are in Uganda Shillings. The rates in percentages are a percent of the ex-factory price of the respective good.

Table 2.1 shows the excise tax rates in Uganda from FY 2014/15 – the baseline year – and the changes in FYs 2015/16 and 2016/17. Two of the rates are specific and are charged per liter or per 1,000 sticks for fuels and cigarettes, respectively. The tax rates on cigarettes increased by 15.4 percent and 25.0 percent relative to the baseline rate in FYs 2015/16 and 2016/17. The tax rates on beer increased by about 12.5 percent relative to the baseline rate. On the other hand, Fuels had the lowest increases compared to other excisable goods, with increases of 3.3 percent and 9.9 percent in FYs 2015/16 and 2016/17, respectively. Other products, such as motor vehicle lubricants, confectionaries, and furniture, had an excise tax imposed for the first time in FY 2015/16. In FY 2016/17, the tax rates on motor vehicle lubricants and confectionaries doubled, while only locally manufactured furniture had the tax rate reversed.

Given that some of the products did not have excise tax rates at baseline, it is not possible to construct a continuous treatment variable that captures all the changes in the excise duty rates. While changes in ad valorem tax rates could be expressed in terms of percentage point decreases or increases, this is not possible for excisable goods such as cigarettes and fuels because they have specific rates, which are applied per unit of output. On the other hand, a binary indicator for a change in the tax rate will throw away information on the actual changes. Note that a continuous treatment indicator for those products with tax rates at baseline completely ignores the introduction of “new” tax rates

on products that did not have a tax rate prior. The existence of specific and ad-valorem tax rates for different products makes it impossible to use a continuous treatment indicator. While the binary indicator for treatment does not capture the difference in the changes, it captures all changes and hence it is used for the main results in this chapter.

Under the PFMA, the proposed changes to tax policy are currently presented by 1st April, three months before the end of the current fiscal year. The approval process is expected within two months of that presentation. Once the proposed changes are presented in the Ugandan Parliament for debate, they become a public record, and firms get to know what taxes they are expected to face in the next tax period with three months (April, May and June) left in the current fiscal year. The availability of this information about three months before the effective date provides advance notice to firms of the taxes they can expect in the next fiscal year. Firms can then be assumed to fully anticipate tax rate changes (Mertens and Ravn, 2012). To that effect, the PFMA of 2015 provides advance notice.

Advance notice may be advantageous for taxes such as capital gains – a tax on a markup of an asset that has appreciated in value such as a stock – where firms can realize gains within two to three months before a proposed tax change is implemented. However, advance notice may not provide any tax advantage for firms when excise tax rates

change, since it might take longer than three months for firms to adjust production plans to avoid or minimize their tax liability, even when changes in tax rates are anticipated.

The process of approving excise tax changes with two to three months before the end of a fiscal year may not necessarily cause firms to change output in the short run – since firms are less likely to act on this information in the short run – but only removes the uncertainly that firms might face going into a new fiscal year. It is possible that there are two effects here because both reforms were implemented in the same year, one for the information availability and the other for changes in the excise tax rates. It is difficult to separate these two effects, but providing this clarity alone without any change in the tax rates would improve the planning conditions for firms without having an effect on firms' sales revenue and profits. In addition, the information is available to all firms regardless of whether their tax rates changed or not, and these firms are likely to process this information in the same way. This means that providing tax rates information two or three months earlier might have little effect on firms' sales revenue or output. Under the assumption that firms may not in the short run act on the information that their taxes will change, and that all firms process the available information in the same way, the effects estimated in this chapter are primarily for the impact of the changes to Uganda's excise

duty rates in FY2015/16 on firms' sales revenue and profits, not the effect of the changes on the timing of the announcement of the tax rates.[7]

The manufacturers, suppliers, wholesalers, and retailers of the products whose taxes have changed, form the "treated" firms, whose outcome variables are compared to those of suppliers of other goods that either were not subject to the excise tax or did not have their excise tax rates adjusted (comparison group firms). Time-invariant firm-specific unobserved characteristics are taken into account. The identifying assumption is that, conditional on several control variables, including firm fixed effects, in the absence of the tax, changes in the outcome variables of the "treated" firms would have otherwise been the same as the changes for firms that did not face a change in taxes (Angrist and Pischke, 2008). The next section discusses the conceptual framework used in this chapter.

2.3 Conceptual Framework

The theory of efficient commodity taxation is well established in the tax literature, and it is mostly grounded in the Ramsey (1927) rule. This rule suggests that if governments cannot impose lump-sum taxes to generate a required amount of revenue, commodities with relatively inelastic demand should be taxed more. Other rules indicate

[7] The discussion in the introduction of advance notice by the Public Finance Management Act was a major reform in the budget process that allowed the Ugandan government to streamline its timelines, hence its inclusion in this chapter. But the effect of such advance notice is not estimated because a period of three months or less is too short for firms to adjust their production plans. Also, advance notice affects both "treated" and "non-treated" firms equally.

that if it is challenging to tax commodities such as leisure, its complements should be taxed at higher rates (Corlett and Hague, 1953). The other rule that follows from the theory on optimal commodity taxation is that tax rates should be inversely proportional to their own-price elasticities of demand (Ramsey, 1927; Sandmo, 1987). Sandmo (1987) developed a theoretical model that suggests that all three rules are very similar because the assumptions used in all cases have sound economic intuition. The rules developed in the literature are premised on the fact that governments will dictate tax rates to satisfy their budget constraints.

The rules discussed above focused on what governments do to raise tax revenues to satisfy their budget constraints. Little consideration is given to what *producers* might do when they suspect that the government might increase or impose a tax on their output. A conceptual framework is developed in this section to systematically think about what firms might do when the likelihood of a change in tax rates on their products increases, and what the firm's actions mean for government tax revenues. It closely follows the work of Chambers and Quiggin (2000) on production under uncertainty.

Consider a one-product firm. The quantity of the product it produces is denoted by $q \geq 0$. The cost function for the output is $C(q)$, where competitive input prices are normalized to one for expositional clarity. Suppose the government raises revenue by taxing q at a specific tax rate $\tau > 0$ per unit, but it is considering an increase in the tax

to $\tau + \Delta\tau$. Unfortunately, the firm must make output decisions before learning the government's final tax policy. Therefore, the firm faces uncertainty with two possible states of the world. In state $s = 0$, the government does not raise taxes, and the firms face competitive product prices $p - \tau > 0$. In state $s = 1$, the government does raise taxes, and the firms face competitive product prices $p - \tau - \Delta\tau > 0$. The probability of states 0 and1 occurring is θ_0 and θ_1, respectively, with $\theta_0 > 0$, $\theta_1 > 0$, and $\theta_0 + \theta_1 = 1$.

The firm's profit in states 0 and 1 can then be written as:

$\pi_0 = (p - \tau)q - C(q)$ and $\pi_1 = (p - \tau - \Delta\tau)q - C(q)$

The firm's decision problem is to $\max_{q \geq 0} E(\pi) = \theta_0\,(\pi_0) + \theta_1(\pi_1)$. This objective can be written as:

$$\max_{q \geq 0} \theta_0 \left((p - \tau)q - C(q)\right) + \theta_1\left((p - \tau - \Delta\tau)q - C(q)\right) \qquad (2.1)$$

Assuming an interior solution, the first order condition is:

$p - \tau - C_q(q^*) - \theta_1\Delta\tau = 0$, which implies that $C_q(q^*) = p - \tau - \theta_1\Delta\tau$ (2.2)

where $C_q = \frac{\partial C(q^*)}{\partial q} \geq 0$ and $C_{qq} = \frac{\partial^2 C(q^*)}{\partial q^2} \geq 0$, that is, increasing marginal costs in output.

The primary question of interest is how do government tax revenues under uncertainty compare to tax revenue in states 0 and 1? To get at this question, one needs to derive the marginal costs when $s = 0$ and $s = 1$ and compare them to equation (2.2). With tax certainty (when $s = 0$ or $s = 1$), the state contingent profits can be redefined as:

$\pi_0 = (p - \tau)q^0 - C(q^0)$ and $\pi_1 = (p - \tau - \Delta\tau)q^1 - C(q^1)$

The firm's decision problem is to choose the state-contingent outputs (q^0, q^1) that maximize the firm's expected profits. The decision problem can be written as:

$$\max_{q^0 \geq 0,\, q^1 \geq 0} \theta_0 \left((p - \tau)q^0 - C(q^0)\right) + \theta_1\left((p - \tau - \Delta\tau)q^1 - C(q^1)\right) \quad (2.3)$$

Assuming an interior solution, the first order conditions are:

$p - \tau - C_{q^0}(q^{0*}) = 0$, which implies that $C_{q^0}(q^{0*}) = p - \tau$ (2.4)

$p - \tau - C_{q^1}((q^{1*})) - \Delta\tau = 0$, which implies that $C_{q^1}(q^{1*}) = p - \tau - \Delta\tau$ (2.5)

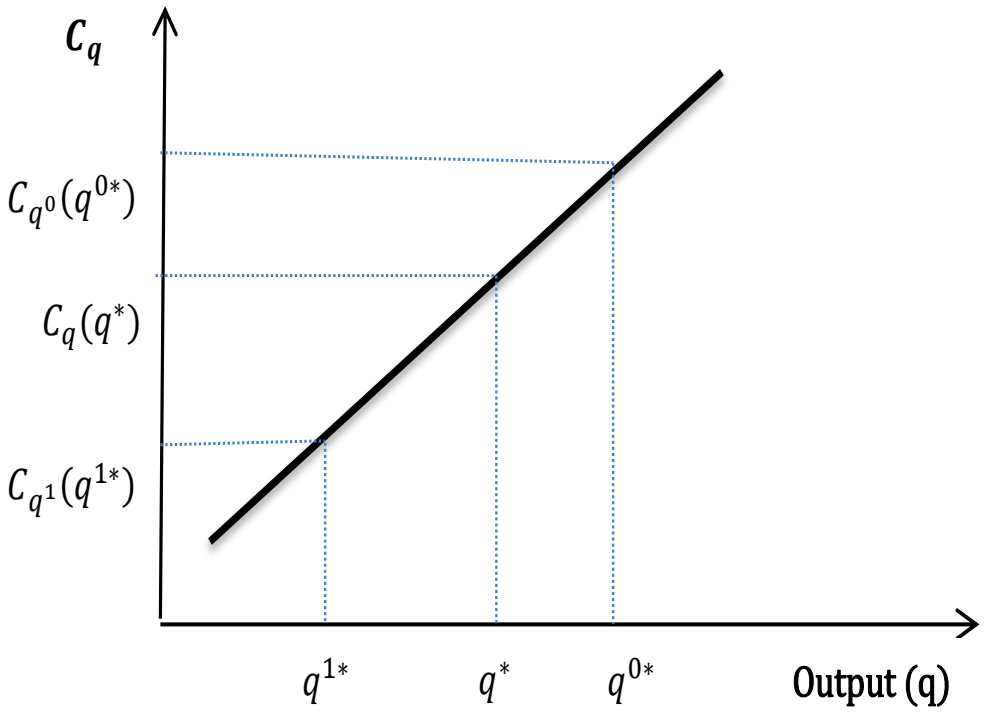
Comparing the marginal costs in equations (2.2), (2.4), and (2.5), one can state that:[8]

$C_{q^0}(q^{0*}) > C_q(q^*) > C_{q^1}(q^{1*})$ (2.6)

[8] Since $0 \leq \theta_1 \leq 1$, this implies that, $\theta_1\Delta\tau \leq \Delta\tau$ and $C_q > C_{q^1}$

Equation (2.6) means that the marginal cost under tax certainty without a change in tax per unit of output is greater then the marginal cost with tax uncertainty. The marginal cost with tax uncertainty is greater than the marginal cost under tax certainty with a change in tax per unit of output. Since the marginal cost is increasing in output, the relationship in equation (2.6) is shown in Figure 2.1

Figure 2.1: A graph of Marginal Cost against Output



It follows from Figure 2.1 that

$$q^{0*} > q^* > q^{1*} \qquad (2.7)$$

Equation (2.7) suggests that the firm will choose the highest level of output under tax certainty with no change in the amount of tax per unit of output (q^{0*}) as compared to the other cases. In addition, the firm chooses more output under uncertainty (q^{*}) as compared to a state of tax certainty with a change in tax (q^{1*}). Government tax revenue is defined as $\boldsymbol{R} = (\tau + \Delta\tau)\boldsymbol{q}^{*}$it follows from equation (2.7) that:

$$R^{0*} = \tau q^{0*} > R^{*} = \tau q^{*} \qquad (2.8)$$

Equation (2.8) implies that the government will raise more tax revenue if firms get advance notice that there will be no change in the amount of tax per unit of output compared to when firms are faced with uncertainty on whether the tax per unit of output will change. The advance notice might help governments raise more if they do not plan to change tax rates, and firms know it because firms will choose to produce a higher-level output.

The result follows from equation (2.7) is:

$$R^{*} = (\tau + \Delta\tau)q^{*} > R^{1*} = (\tau + \Delta\tau)q^{1*} \qquad (2.9)$$

Equation (2.9) implies that in theory, the government can expect to raise more tax revenue from a change in the amount of tax per unit of output under tax uncertainty relative when there is tax certainty (advance notice), and there is an actual increase in tax. The theoretical prediction suggests that the government will raise more tax revenue from

a tax increase if firms do not have any advance notice of such a change. Tax uncertainty may help the government raise more tax revenue if it plans to actually change tax rates.

Recall that in FY 2015/16, firms in Uganda knew with three months advance notice the tax rates that would apply the following tax year. Based on the theory discussed above, the expectations are that firms that face a tax increase will choose lower output than firms that know that there will not be an increase in tax on their output. The other expectation is that government revenues from the tax increase will be lower since firms choose lower levels of output relative to firms that do not face a tax increase, and all the firms have advance notice about their tax status. The next section describes the data.

2.4 Data and Summary Statistics

This chapter's analysis uses, merged data from Uganda's corporate income tax returns and from available electronic excise tax data,[9] for the financial years from 2013/14 to 2016/17. Both datasets have a unique firm identifier that allows the two sources of data to be merged. From the excise tax data, firms are identified using an anonymous identification number and product descriptions for manufacturers of

[9] Electronic excise data are excel spreadsheets put together by the Uganda Revenue Authority to summarize sales, production, and tax revenue collections from excisable goods.

excisable goods; these variables are critical to identify firms that face a change in excise tax rates (treated firms). Firm-specific characteristics, including outcome variables of interest (firm sales revenue and profits), were obtained from corporate income tax returns.[10] The corporate tax returns data summarize the activities of a firm in a given financial year (July to June). The expectation is that the annual corporate return declarations and the monthly excise data should match in terms of declared sales revenues after adjusting for returned goods. Note that firm-level data include firms' sales revenue and firm profits, but do not include excise revenue payments for the period under study – these data are not part of the corporate tax return. Table 2.2 provides an overview of the data used for the analysis.

From Table 2.2, the total returns are 60,838, of which 4,445 (7.3%) belong to treated firms, and 56,393 (92.7%) belong to comparison group firms. Given that the excise tax applies to a small proportion of firms, many more returns belong to firms that either were not subject to the excise tax or did not have their excise tax rates adjusted. The comparison group is a combination of these two categories of firms.

[10] A brief description of these variables and summary statistics are provided in the appendix. Firm-level data used in this study are from the Uganda Revenue Authority, but restrictions apply to the availability of these data, and so are not publicly available. Data can however be accessed, if permission is given, from the Uganda Revenue Authority and/or the Ministry of Finance.

Table 2.2: Tax Returns for Treated and Comparison Group Firms

Financial Year	Treated returns	Comparison group returns	All tax returns	Percent treated
2013/14	1,272	12,207	13,479	9.4%
2014/15	1,123	12,630	13,753	8.2%
2015/16	1,108	15,969	17,077	6.5%
2016/17	942	15,587	16,529	5.7%
Total	4,445	56,393	60,838	7.3%

It is noticeable from the data that there are relatively fewer returns from both treated and comparison group firms in the second year after the excise tax rates were changed (FY2016/17). According to Uganda's Excise Duty Act, the Uganda Revenue Authority must register firms that deal in excisable products. The firms are also required to renew their license with the Authority every year. It might be the case that some of the treated firms decided not to renew their excise licenses since they did not submit tax returns after the change in excise tax rates. Firms could be substituting away from the excisable goods, forcing them to temporarily close rather than dealing with the relatively high taxes and stiff competition from the well-established firms in the excise market. The substituting process may take time, making it less likely that firms engaged in this type of behavior will file a tax return in a year or two after closure. Based on the author's understanding of the Ugandan markets for goods subject to the excise tax, a few large firms dominate the market and are still operating. The changing behavior of firms likely occurs among young or small businesses. If indeed young or small businesses change

their behavior – they can self-select in and out of the tax system – this will be problematic for estimation, but less so if one controls for firm-level fixed effects.

Ideally, the comparison group should not be very different from the treated group; I check the extent to which they may differ in observable characteristics at baseline. A two-sample t-test is used to assess the differences between the treated and comparison groups' means at baseline. The differences in the means of the main variables are summarized in Table 2.3.

Table 2.3: Differences between Treated and Comparison Group averages at Baseline

	Comparison group mean n=24,837	**Mean Treated n=2,395**	**Difference**	**t**	**Pr(T>t)**
Log sales revenue	19.23	20.11	0.88	13.77	0.0000***
Log gross profits	17.50	17.75	0.24	2.66	0.0078***
Log depreciation allowance	11.40	11.90	0.50	2.73	0.0063***
Log financial expenses	12.17	12.56	0.39	2.46	0.0140**
Log employee compensation	16.48	16.57	0.09	1.78	0.0749*

Means and t-test are estimated by linear regression. The P-values show the extent to which the differences between the treated and comparison group means are significant at baseline *** p<0.01, ** p<0.05, * p<0.1. N = 27,232.

Table 2.3 shows that, at baseline, there are significant differences between the treated and comparison group firms in the levels of the main outcome variables (firm sales revenue and gross profits) since the p-values are less than 0.01. These differences do not necessarily pose any estimation challenges since it is the *change* in the averages over time that matter. In the covariates that characterize a firm (log depreciation, log financial expenses, and log payroll size/ employee compensation), statistically significant differences in log depreciation and log financial expenses are observed between the comparison and treated group means at baseline since the p-values are smaller than 0.05. On the other hand, the difference in log employee compensation is not statistically significant at the 5 percent level. The largest difference in these covariates is in log depreciation expenses and it is about 0.5 log points. The differences in these covariates including employee compensation are accounted for during estimation. According to Uganda's Tax Procedures Code Act of 2014, the penalties for falsifying a tax return are very severe and could cause a business to shut down; this, coupled with strict enforcement, may ensure relatively accurate data. Nonetheless, for firm level analysis there is no choice but to believe the tax enforcement agency that tax returns data are considered accurate until a tax audit proves otherwise; the assumption is that these data are true record of firms' economic activity in Uganda. If the assumption is violated then the results from the empirical analysis in this chapter may be biased. The next section discusses the empirical strategy used in this study.

2.5 Empirical Strategy

In this chapter, both the "standard" difference-in-difference (DID) and DID with matching are used to estimate the effect of changes in excise tax rates on firms' sales revenue and profits in Uganda. The DID estimation equation is:

$$\ln(Y_{it}) = f_i + \tau time + \boldsymbol{X}_{it}\beta + \delta(I_i * \textit{After Fiscal Year 2015-16}) + \varepsilon_{it} \quad (2.10)$$

where $\ln(Y_{it})$ is the log of the outcome variable (firm sales revenue or firm profits) for firm i at time t, f_i is a firm-level fixed effect that controls for unobserved time-invariant firm-specific characteristics, $time$ is a time trend that is assumed to be the same for both treated and comparison group firms; it captures the effect of macroeconomic shocks that would affect all firms' sales revenue and profits in the same way,[11] $\boldsymbol{X_{it}}$ is included to control for time-varying observable firm-specific characteristics, such as capital structure, leverage, and payroll size, which describe the nature of a firm and how it evolves over time. $\boldsymbol{X_{it}}$ also includes a dummy variable for period $t = 4$ to control for any time-specific shocks that affect both treated and comparison group firms in the same way at that time. Finally, I_i is a time-invariant dummy variable that equals 0 for comparison group firms, 1 for treated firms whose excise tax rates were increased and -1 for firms whose excise tax rates were reduced (*Taxed firms*) for all time periods and "*After Fiscal Year 2015-16"* is a dummy variable that equals 1 for t = 3 and 4. The interaction term is therefore an indicator for treatment and equals 1 for treated firm i only after the 'new' tax rate is implemented. The coefficient on this interaction term is the impact of the change in

[11] The common time trend takes on values 0, 1, 2, and 3 at $t = 1, 2, 3, and\ 4$ respectively.

excise tax. Finally, ε_{it} is a time-varying firm-level error term that captures unobserved time-varying factors that vary over firms and is assumed to be uncorrelated with all observed variables in Equation (2.4). That is, $E\left(\varepsilon_{it=3,4}\middle| I_i, X_{it=3,4} \text{ for all } i\right) = 0$.

Suppose that the change in an excise tax is implemented at $t = 3$ and 4, then the DID estimator is written as:

$\hat{\delta} = E\left(Y_{1,I=1,t=3,4} - Y_{0,I=1,t=1,2}|X_{it}\right) - E\left(Y_{0,I=0,t=3,4} - Y_{0,I=0,t=1,2}|X_{it}\right)$, where Y_1 *and* Y_0 are the treated and untreated (potential) outcomes for a firm, respectively.

Since it is not possible to observe the untreated outcome for treated firms at $t = 3$ *and* 4, then $E\left(Y_{0,I=1,t=3,4} - Y_{0,I=1,t=1,2}|X_{it}\right)$ – how treated firms' sales revenue or profits would have changed in the absence of a change in the excise tax rates – is the missing counterfactual trend, the DID estimator assumes that the observed trend in the outcome variables for comparison group firms is the same as the counterfactual trend, which is known as the "common/parallel trends" assumption (Angrist and Pischke, 2008; Glewwe and Todd, 2021). This can be written more formally by adding and subtracting the unobserved outcome for treated firms after the change in tax $E\left(Y_{0,I=1,t=3,4}|X_{it}\right)$ to the expression of the DID estimator, such that:

$$\hat{\delta} = E\left(Y_{1,I=1,t=3,4} - Y_{0,I=1,t=1,2}|X_{it}\right) - E\left(Y_{0,I=0,t=3,4} - Y_{0,I=0,t=1,2}|X_{it}\right)$$
$$+ E\left(Y_{0,I=1,t=3,4}|X_{it}\right) - E\left(Y_{0,I=1,t=3,4}|X_{it}\right)$$

Rearranging the terms in the above expression implies that:

$\hat{\delta} = E\left(Y_{1,I=1,t=3,4} - Y_{0,I=1,t=3,4}|X_{it}\right) - E\left(Y_{0,I=1,t=3,4} - Y_{0,I=1,t=1,2}|X_{it}\right) + E\left(Y_{0,I=0,t=3,4} - Y_{0,I=0,t=1,2}|X_{it}\right)$.

The parallel trends assumption, therefore, means that:

$E\left(Y_{0,I=1,t=3,4} - Y_{0,I=1,t=1,2}|X_{it}\right) = E\left(Y_{0,I=0,t=3,4} - Y_{0,I=0,t=1,2}|X_{it}\right)$, which is the same as saying the change in the outcome variables for the treated firms would have been the same as the change in the outcomes for the comparison group firms in the absence of the change in the excise tax.

In practice, however, the parallel trends assumption may not hold – this assumption is tested later in this chapter by regressing pretreated outcomes on the indicator for treatment. Given that there are data for four time periods, two periods before and two periods after the change in the excise tax, Glewwe and Todd (2021) suggest that, if the parallel trends assumption does not hold, then the treatment effect can be estimated in the presence of non-parallel linear time trends. The impact of the tax change can also be estimated for each period after the tax changes were implemented – this allows the treatment effect to vary over time. With these modifications in mind, equation (2.10) can be rewritten as:

$$\ln(Y_{it}) = f_i + \tau_0 time + \tau_1(time * I_i) + \boldsymbol{X}_{it}\beta + \sum_{t=3}^{4} \delta_t D_{it} + v_{it}, t = 1, 2, 3, 4. \quad (2.11)$$

where D_{it} is an interaction term between I_i and dummy variables for $t = 3$, and $t = 4$. The other variables in equation (2.11) are the same as those in Equation (2.10). Equation

(2.11) allows the treatment effect for treated firms to be different at $t = 3$ – *One year after tax change*, and t = 4 – *Two years after tax change*, and also relaxes the common trends assumption by allowing different time trends for treated and comparison group firms. It is assumed that $E(v_{it=3,4}|I_i, X_{it=3,4} \text{ for all } i) = 0$, which means that the time-varying firm-level error term $v_{it=3,4}$ is uncorrelated with all observed variables in Equation (2.11).

The effects from most DID studies are sensitive to the choice of the comparison group primarily because one does not observe the outcome of a treated firm in the absence of a law change or policy intervention (counterfactual). This problem becomes magnified if there is reason to believe that firms can self-select into treatment (Heckman and Smith, 1999; Blundell et al., 2004). In this study, the change in the excise tax rates is an exogenous process; firms that produce excisable goods do not have the option to self-select into the tax. In addition, the market for producers of excisable goods is relatively small in Uganda, and few large producers characterize it. However, this does not rule out problems associated with firms that go out of business whenever there is a policy change; this is a weakness that cannot be addressed because of resource constraints and the difficulty of tracing former directors of a closed firm. A related question is whether to compare outcomes for treated firms to those of all firms that do not face a change in tax or firms that do not face a tax change yet are similar to the treated firms in capital structure, leverage, and payroll size.

To address concerns about the choice of the comparison group, I follow a technique used by Blundell et al. (2004) in a study that estimates the impact of a program that offers work incentives to young people between 18 and 24 years old on employment in the United Kingdom. I exploit the fact that the excise tax was for a small group of firms producing excisable goods and not all Ugandan firms. The availability of corporate returns data for all firms provides a large pool of untreated firms; a propensity score is then generated and used to identify untreated firms with similar covariates in $\boldsymbol{X}$ as the treated firms. Notably, a firm is not matched on every observable characteristic (capital structure, leverage, and payroll size) but instead on its propensity score. The propensity score helps to match treated firms to similar comparison group firms drawn from a pool of tax returns for firms that are not affected by the excise tax rates. This process ensures that the observed covariates of the treated and comparison group firms are similar. According to Blundell et al. (2004), this process balances the distribution of observed covariates in the treated and untreated firms before implementing the excise tax changes. The main objective of propensity score matching is to find a comparison group conditional on the observed firm-specific characteristics such as capital structure, leverage, and payroll size, which is more similar to treated firms. Note that propensity score matching requires that the treatment be statistically independent of the outcome variables of interest (firms' sales revenue and profits) after conditioning on the observable firm-specific characteristics. A treated firm's propensity score is matched to

multiple comparison group firms with the same propensity score. In the process of matching, there was no common support in the propensity score for 12,103 returns. These returns are dropped for the specification with matching. From the comparison group, there were 11,893 returns with no common support in the propensity scores, and 210 returns for treated firm.

Finally, changes in excise tax rates are expected to have an impact on excise tax revenues. If the objective of the tax change is to increase excise revenue, the effects might be positive. But if the goal of the policy change is to minimize the consumption of "sin" goods, then excise revenues may decrease as a result of the tax change. Unfortunately, firm-level data on the excise revenue payments by each firm were not available for the period under study. However, aggregated product-level data for both treated and untreated excisable products are available. These data allow for the effect of changes in excise tax rates on excise tax revenue to be estimated. The estimation equation is:

$$\ln(ER_{kt}) = \alpha + \tau_0 time + \tau_1(time * I_k) + \sum_{t=3}^{4} \delta_t D_{kt} + \mu_{kt}, t = 1, 2, 3, 4. \qquad (2.12)$$

where $\ln(ER_{kt})$ is the log of excise tax revenue from product k at a time t, α is a constant term, $time$ is a common time trend which captures the effect of macroeconomic shocks that would affect excise tax revenues from both treated and untreated excisable products in the same way, D_{kt} is an interaction term between a dummy variable for either

$t = 3$ – *One year after tax change*, or t = 4 – *Two years after tax change*, and I_k which is a time-invariant dummy variable that equals 0 for excisable products whose tax rate did not change, 1 for those excisable products whose tax rates increased, and -1 if the tax rates decreased (*Taxed products*) for all time periods – this variable is the indicator for treatment. The product-level time-varying error term in Equation (2.12) is μ_{kt} and it captures unobserved time-varying factors that vary over excisable products. It is assumed to be uncorrelated with the variables in Equation (2.12). Notably, Equation (2.12) is similar to Equation (2.11) in that it relaxes the parallel trends assumptions and also allows the treatment effect to vary over time. The next section discusses the results.

2. 6 Results and Discussion

As discussed in the empirical strategy, this chapter aims to estimate the effect of changes in excise tax rates on firms' sales revenue and profits, and also on the government's excise tax revenue. The results from estimation of Equation (2.10) for sales revenue and profits are shown in Table 2.4 and Table 2.5, respectively. Specification (1) shows results from a basic diff-in-diff without any controls but includes firm-level fixed effects that control for unobserved time-invariant firm-specific characteristics, a common time trend for both treated and comparison group firms, which captures the effect of macroeconomic shocks that would affect all firms' sales revenue and profits in the same way, this specification also includes a year specific dummy variable for $t = 4$, to control for any time-specific shocks that affect both treated and comparison group firms in the

same way at that time. Specification (2) then adds firm-specific time-varying observable variables such as capital structure, leverage, and payroll size, which describe the nature of a firm and how it evolves over time. Specification (3) shows results for treated firms that are matched on the covariates to comparison group firms, this specification's effects are for taxed firms for which similar untaxed firms, in terms of capital structure, leverage, and payroll size, can be found in the data.[12]

Table 2.4: The Effect of the Change in Excise Tax Rates on Firm Sales Revenue

	Log sales revenue		
	(1)	(2)	(3)
Taxed firms * After Fiscal Year 2015/16	-0.083***	-0.064**	-0.058**
	(0.028)	(0.025)	(0.025)
Controls	No	Yes	Yes
Time Trend	Yes	Yes	Yes
Dummy variable for t=4	Yes	Yes	Yes
Firm-level fixed effects	Yes	Yes	Yes
Matching on covariates	No	No	Yes
Controls	No	Yes	Yes
Observations	60,838	60,838	48,735
R-squared	0.043	0.177	0.168
Number of clusters	26,798	26,798	17,953

Robust standard errors in parentheses and are clustered at a firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables are log depreciation expense, log financial expenses, and log employee compensation; these variables describe a firm's nature and they vary both across time and across firms; the control variables are used to generate the propensity score that is used for matching in specification (3).

[12] From the matching process, there were no matches for 210 treated firms (2 percent of the unmatched returns). From the comparison group, there were 11,893 firms (98 percent of the unmatched returns) that could not be matched to any treated firm. The matching process was based on a propensity score generated using firm-specific observable characteristics before the tax change such as capital structure, leverage, and payroll size.

Specifications (1) of Table 2.4 shows that treated firms experienced a decrease in sales revenue of about 8.3 percent relative to the comparison group. The result is statistically significant at the 1 percent level. Adding time-varying firm-specific control variables, results in a marginally smaller effect of the change in excise tax rates on firms' sales revenue relative to the results in Specification (1). Specification (2) shows this result, which suggests that firms that face an increase in excise tax rates experienced a 6.4 percent decrease in sales revenue relative to the comparison group firms. Matching on covariates preserves the sign of the effect of an increase in the excise tax on firms' sales revenue, though the magnitude (-5.8 percent) is slightly smaller. This result is shown in specification (3); it suggests that the treated firms experienced a 5.8 percent decrease in sales revenue relative to the comparison group firms. The result is significant at the 5 percent level, even though matching results in a 19.9 percent decrease in the sample size, from 60,838 to 48,735 observations. The sample size is still large enough to generate enough statistical power to minimize the likelihood of committing a type two statistical error. The benefit from matching is to improve balance on covariates between treated and comparison group firms prior to the change in excise tax rates.

The preferred estimate in Table 2.4 is specification (2). It provides evidence that the change in the excise tax rates in Uganda in Fiscal Years 2015/16 and 2016/17 had a statistically significant negative effect on the treated firms' sales revenue of 6.4 percent relative to comparison group firms; these results are unbiased, assuming that the parallel

trends assumption holds and that the effect of the increase in excise tax rates on firms' sales revenue is constant over time.

Table 2.5 shows the effects of excise tax rate increases on firm profits, using the same specifications as in Table 2.4. The estimates for specification (1) of Table 2.5 indicate that treated firms experienced a 30.1 percent decrease in firm profits relative to comparison group firms; this result is statistically significant at the 1 percent level.

Table 2.5: The Effect of the Change in Excise Tax Rates on Firm Profits

	Log gross profits		
	(1)	(2)	(3)
Taxed firms*After Fiscal Year 2015/16	-0.301*** (0.113)	-0.272** (0.111)	-0.268** (0.111)
Controls	No	Yes	Yes
Time Trend	Yes	Yes	Yes
Dummy variable for t=4	Yes	Yes	Yes
Firm-level fixed effects	Yes	Yes	Yes
Matching on covariates	No	No	Yes
Controls	No	Yes	Yes
Observations	60,838	60,838	48,735
R-squared	0.003	0.025	0.024
Number of clusters	26,798	26,798	17,953

Robust standard errors in parentheses and are clustered at a firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables are log depreciation expense, log financial expenses, and log employee compensation; these variables describe a firm's nature and they vary both across time and across firms; the control variables are used to generate the propensity score that is used for matching in specification (3).

Taking into account time-varying observable firm-specific characteristics in specification (2) of Table 2.5 slightly reduces the effect of the increase in the excise tax on firm profits by 2.9 percentage points relative to specification (1). The result in specification (2) shows that treated firms experienced a 27.2 percent decrease in firm profits relative to comparison group firms; this result is significant at the 5 percent level and it is the preferred estimate in Table 2.5. After finding matches for treated firms from a large pool of untreated firms, the absolute value of the estimated effect of the tax change on firms' profits marginally decreased by 0.4 percentage points in magnitude to 26.8 percent, as shown in specification (3). This result shows that the treated firms experience a 26.8 percent decrease in firm profits relative to the comparison group firms, even with the 19.9 percent decrease in the sample size, the result is statistically significant at the 5 percent level.

It should be noted that an excise tax is not a tax on profits but instead on a firm's output. Its imposition will have an indirect effect on firm profits. This effect could be quite large, on average. Based on the results discussed above, the reported decrease in sales revenue and, consequently, in profits of the taxed firms are relatively large for firms that face increases in the excise tax rates. Such effects should not be ignored by Ugandan tax policymakers, who widened the scope of the excise taxes beyond the traditional 'sin' goods to include goods whose consumption has no associated negative externalities. The results presented in Table 2.4 and Table 2.5 might be biased if the parallel trends

assumption does not hold, and any policy conclusions based on the results should be interpreted cautiously, yet they might still offer an insight in the direction of the effect of the changes in tax rates on firms' sale revenues and profits. Overall, caution is needed because the results may be biased and as such may not be conclusive as a guide to changes in tax policy.

The results discussed above are the average treatment effects on the treated firms assuming that treated and control group firms have parallel trends, and that the treatment effect is constant over time. To test the parallel trends assumption, equation (2.10) is re-estimated. But, the indicator for treatment is an interaction term of the time periods pre-tax change and the indicator for taxed goods. If there were other things apart from the tax change, causing the sales revenue and profits to differ significantly between firms whose taxes increased and firms whose taxes did not increase, they would show significant effects in periods before the tax changes. The results for this test are in Table 2.6. For both total sales revenue and profits the treatment indicator has no significant effect on both firms' sales and profits before changes in excise tax rates. This evidence suggests that the parallel trends assumption is reasonable.

Table 2.6: Checking for the Effect of the Tax Before the Excise Tax Changes

	(1)	(2)
	Log total gross sales	Log gross profits
Fiscal Year =2014/15 (t=2)	0.129***	0.117***
	(0.010)	(0.043)
Taxed firms * Fiscal Year 2014/15	0.009	0.080
(t=2)	(0.025)	(0.129)
Controls	Yes	Yes
Firm-level fixed effects	Yes	Yes
Observations	27,232	27,232
R-squared	0.130	0.016
Number of clusters	17,954	17,954

Robust standard errors in parentheses and are clustered at a firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables are log depreciation expense, log financial expenses, and log employee compensation; these variables describe a firm's nature and they vary both across time and across firms;

Given the results in Table 2.6, the expectation is that graphical evidence should show parallel trends pre-tax change. This graphical evidence is shown in Figure 2.2.

Figure 2.2: Trends in Firms' Sales Revenue and Gross Profit

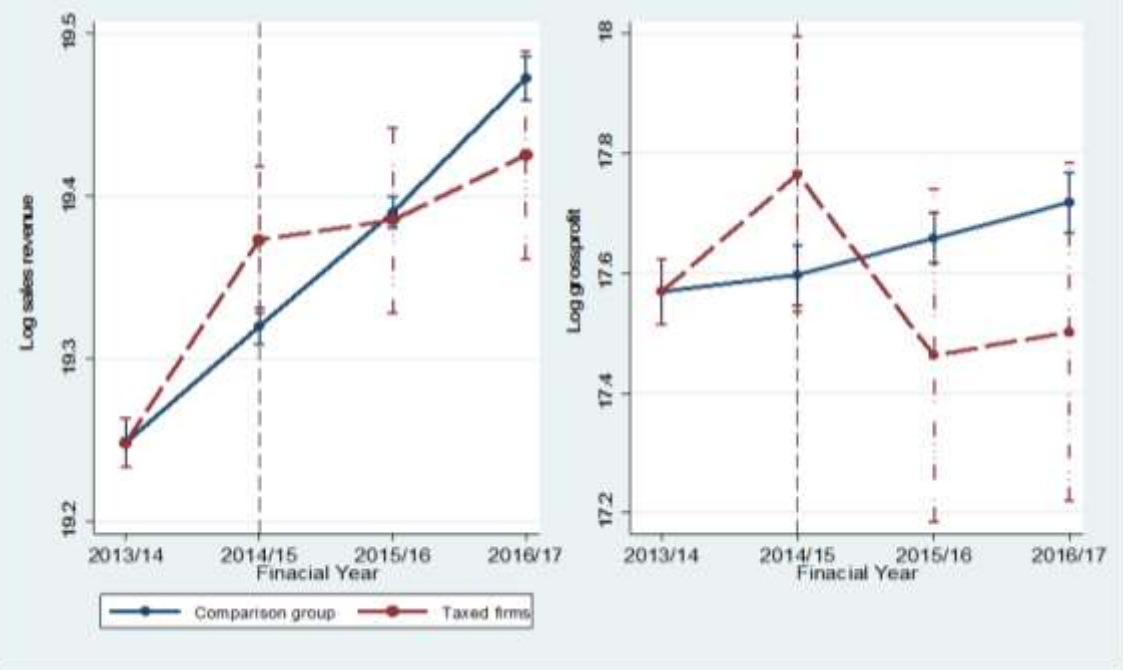


Figure 2.2 is a graph of the averages of the outcome variables (firms' sales revenue and gross profits) for treated and comparison group firms over the period under study. The bars around the point estimates are 95 percent confidence intervals.

However, Figure 2.2 suggests that the parallel trends assumption might be violated since the changes in firms' sales revenue and profits for treated and comparison group firms seem to be different pre-tax change. The mixed results suggest that, even though there are differences in the changes in the outcome variables (firms' sales revenue and profits) between the treated and comparison group firms pre-tax change, these differences might not be statistically significant. This does not in any way suggest that the challenges posed to the DID estimation technique in identifying a causal effect of the increase in excise tax rates on firms' sales revenue and profits should be ignored. The

results in specification (2) of Table 2.4 and Table 2.5 will be biased if the parallel trends assumption does not hold.

Since the parallel trends assumption might be violated, Glewwe and Todd (2021) suggest that, with four time periods, two before the tax change and two after the tax change, a linear non-parallel time trend can be allowed, and the impact of the policy change can be allowed to be different at different periods.

The results discussed earlier assume that the tax effect is constant on average in the two periods of post-tax change. But this is unlikely because over time, firms may learn to cope with the tax change by accessing markets that they did not reach before to increase their sales revenue. If this is the case, then the tax change may have a relatively smaller effect in the second period after the tax change. Assuming that businesses become more aggressive in discovering new within-country markets for their products, the impact of the increase in the excise tax on firm profits will also be smaller in later years. On the other hand, firms might substitute production away from goods with increased tax rates to un-taxed goods, consumer preferences in favor of the new substitutes might adjust slowly over time, and this could lead to a much lower effect of the tax change on firms' sales revenue and profits in the second year after tax change.

To allow for a linear non-parallel trend and test firms' responses to the tax, Equation (2.11) is estimated for both firm sales and profits. The results are shown in Table 2.7.

Table 2.7: Effects of a Change in Excise Tax Rates on Firm Sales Revenue and Profits in the First and Second Years After the Tax Change

	(1)	(2)	(3)	(4)
	Log sales revenue		Log gross profits	
Taxed firms * One year after tax change	-0.113***	-0.112***	-0.364*	-0.370*
(t=3)	(0.038)	(0.038)	(0.203)	(0.203)
Taxed firms * Two years after tax change	-0.201***	-0.130**	-0.611*	-0.596*
(t=4)	(0.062)	(0.062)	(0.313)	(0.312)
Time Trend	0.072***	0.087***	0.044**	0.059***
	(0.005)	(0.006)	(0.021)	(0.021)
Taxed firms * Time Trend	0.046*	0.032	0.104	0.105
	(0.024)	(0.024)	(0.121)	(0.120)
Controls	Yes	Yes	Yes	Yes
Dummy variable for t=4	Yes	Yes	Yes	Yes
Firm-level fixed effects	Yes	Yes	Yes	Yes
Matching on covariates	No	Yes	No	Yes
Observations	60,838	48,735	60,838	48,735
R-squared	0.177	0.168	0.025	0.024
Number of cluster	26,798	17,953	26,798	17,953

Robust standard errors in parentheses and are clustered at a firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables are log depreciation expense, log financial expenses, and log employee compensation; these variables describe a firm's nature and they vary both across time and across firms; the control variables are used to generate the propensity score that is used for matching in specifications (2) and (4).

Specifications (1) and (2) show the excise tax's effect on firms' sales revenues without and with matching, respectively. Both specifications include the effect of the tax one year

after tax increase (t=3) and two years after tax increase (t=4). The sales revenues of firms that faced a tax increase decreased by 11.3 percent one year after the tax change, relative to the comparison group firms. Matching on covariates results in an almost identical effect in specification (2) of 11.2 percent. These results are both statistically significant at the 1 percent level. In the second year post-tax increase, treated firms' sales revenue decreases by 20.1 percent without matching on covariates; with matching on covariates, sales revenue for treated firms decrease by 13 percent relative to comparison group firms, and these result are statistically significant at the 1 percent and 5 percent levels, respectively. Testing the equality of the effects at t = 3 and t = 4 in specifications (1) and (2) results in F-stats of 5.4 and 4.7, respectively. The F-stats both have p-values smaller than 0.05. These results imply that the impact of the excise tax on firms' sales revenue is most severe during the second year of the tax increase.

The first (t=3) and second-year (t=4) effects of the tax increase on firm profits are presented in specifications (3) and (4) of Table 2.7. Specification (3) is without matching while specification (4) matches on covariates. One year post-tax increase, the profits of treated firms decreased by 36.4 percent relative to the profits of the comparison group firms. Matching on covariates marginally increases the effect by 0.6 percentage points to 37.0 percent. These results are both statistically significant only at the 10 percent level. Two years after the tax increase, the profits of the treated firms decreased by 61.1 percent relative to the profits of the comparison group firms; with matching the effect is 1.5

percentage points smaller, at 59.6 percent. These results are both significant only at the 10 percent level. These results suggest that an increase in excise tax rates will significantly reduce firm profits even two years after implementing the tax. Matching on covariates, which arguably improves balance in the distribution of these covariates between the treated and comparison group firms before the tax increase, does not change the magnitude of the estimates very much even though the sample size decreases significantly. These results suggest that the effect of the tax increases on firms' sales revenue and profits is robust to the choice of the comparison group.

Recall that the results in Table 2.4 and Table 2.5 impose the parallel trends assumption and assume that the treatment effect is constant over time. But comparing first and second-year effects in specification (1) of Table 2.7 reveals that the treatment effect differs in the first and second-year post-tax implementation. In addition, the coefficient on the variable that allows for non-parallel trends between treated and comparison group is statistically significant at the 10 percent, which suggests that there might be non-parallel time trends in firms' sales revenue. It is, therefore, reasonable to relax the parallel trends assumption and allow for the treatment effect to differ over time for the effect of increases in excise tax on firms' revenue. The results in specification (1) of Table 2.7 would be "preferred" given the underlying evidence.

In contrast, the first and second-year effects of the increase in the excise tax on firm profits in specifications (3) and (4) of Table 2.7 are not statistically significantly different from each other. This implies that it might be reasonable to assume that the treatment effect for firm profits is constant over time. In addition, the coefficient on the variable that allows for non-parallel trends between treated and comparison group is not statistically significant, which suggests that the parallel trends assumption might hold. Therefore, the results in specification (2) of Table 2.5 would be "preferred" for the effect of the increase in excise tax on firm profits.

Even with advance notice,[13] it appears that firms cannot generate short-term strategies to minimize the impact of the increase in the excise tax on either sales revenue or profits. If they put in place such actions, their effects do not materialize in the first two years after the tax has been implemented. Advance notice might take away the element of surprise of a tax that is still used in many tax jurisdictions. Yet, for the excise tax, which is a tax on a firm's output, firms cannot immediately change their behavior to avoid or mitigate the impact of the tax on their sales revenue and profits. This suggests that changing production plans may take longer than three months.

Recall that the objectives for imposing some of these excise taxes in Uganda include both raising tax revenue to meet government expenditure and limiting

[13] Firms know their next year's taxes with a period of at least three months before the proposed taxes are implemented

consumption of the so-called “sin” goods. Given that the effects on firm sales revenue and profits are arguably large, it is important to examine what happened to tax revenue from taxed firms when the tax rates were increased. On average, excise taxes account for about 10 percent of the total revenue collected by the Uganda Revenue Authority. Before the tax change, excise revenues registered a year-on-year growth of 19.7 percent in FY 2014/15, the year-on-year growth was marginally negative at 0.9 percent in FY 2015/16, the year when the rates were increased. Notice that excise revenues on average did not grow at all. The negative growth rates suggest that some of the excisable products must have performed below the expected tax revenues. Unfortunately, excise tax revenue data are not available at a firm level, but there are monthly product-level data with enough variation to estimate the relationship between excise taxes and government revenues for the period under study.

The results from Equation (2.12) are shown in Table 2.8. Specification (1) imposes the parallel trends assumption and assumes that the treatment effect is constant over time.

Table 2.8: Effects of the Change in Excise Tax Rates on Tax Revenue

	Log excise tax revenue	
	(1)	(2)
Taxed products * Fiscal Year 2015/16	-0.831***	
	(0.256)	
Taxed products * One year after tax change (t=3)		-0.642*
		(0.343)
Taxed products * Two years after tax change (t=4)		-0.898**
		(0.395)
Taxed products * Time trend		0.132
		(0.297)
Time trend	Yes	Yes
Observations	400	400
R-squared	0.040	0.042

Robust standard errors in parentheses ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. All specifications include a constant term

Specification (2) allows for linear non-parallel trends and for the treatment effect to vary over the years. From specification (1), the tax revenue from treated excisable goods was about 83.1 percent lower than the tax revenue from excisables whose tax rates remained unchanged. This result is significant at the 1 percent level.

Figure 2.3 provides suggestive evidence that the parallel trends assumption might not be violated. The results that allow for a non-parallel linear trend are shown in specification (2). The coefficient on the interaction term between "Taxed products" and the "Time trend", which is the test of parallel trends assumption, is not statistically significant. This suggests that the parallel trends assumption might hold.

Figure 2.3: Trends in Excise Tax Revenue

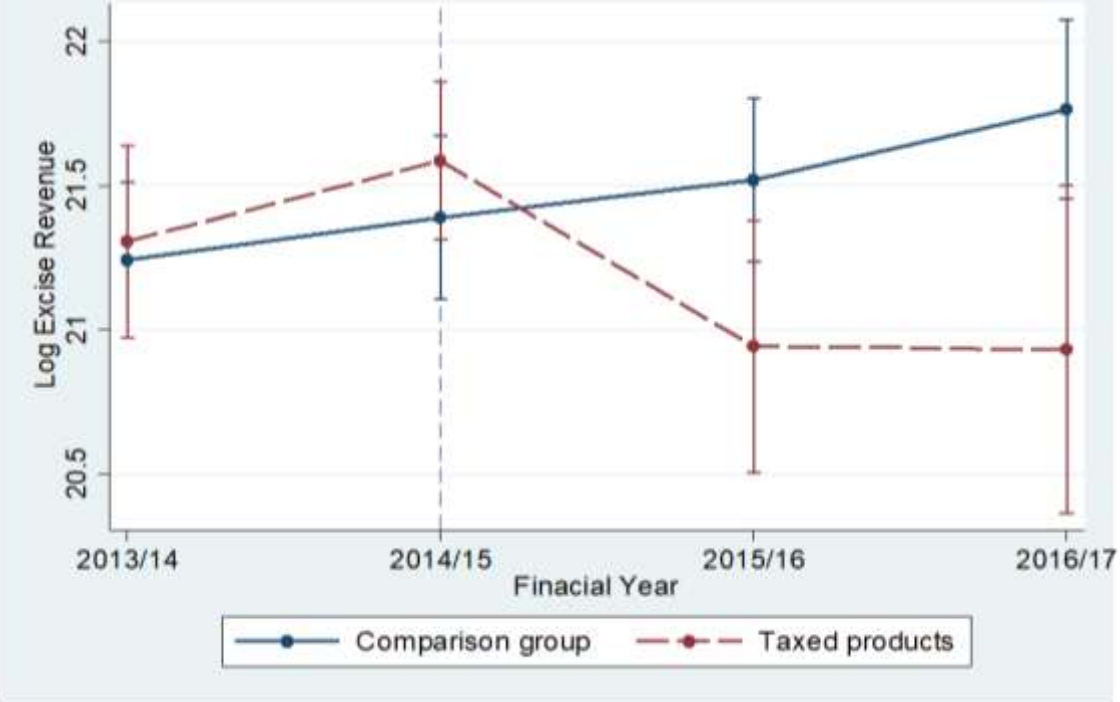


Figure 2.3 is a graph of the averages of excise tax revenue from treated and comparison group goods over the period under study. The bars around the point estimates are 95 percent confidence intervals.

Nonetheless, in the first year after the tax increase, excise tax revenue from treated products decreased by 64.2 percent, this result is statistically significant at the 10 percent level. In the second year post-tax increase, tax revenues from treated goods were 89.8 percent less than those from untreated excisables. This result is statistically significant at the 5 percent level. The decrease in excise tax revenues from treated relative to the untreated excisable goods buttress the earlier results on the effect of the tax increase on firms' sales revenue and profits. However, to understand the large decrease in government tax revenues, a detailed breakdown of the excise tax revenues reported by the Uganda Revenue Authority to the Ministry of Finance as annual tax receipts showed

contradictory results. Table 2.13 in fact shows that overall, after the tax increase, excise tax revenues increased by 29.8 percent; it could be that the decrease in tax revenue from the taxed products was offset by the growth from the untaxed products. Nonetheless, conclusions drawn in the next sections of this chapter, which are based on one dataset, should be treated with the appropriate caution. Reconciling the differences in these data is an area that is being explored for future research.

Compared to the comparison group firms, treated firms' sales revenues and profits decreased by a magnitude of about 20.9 percent and 67.6 percent, respectively, over the two years post-tax increase. It would therefore be difficult to expect any tax revenue gains from the increase in excise tax rates. If it is indeed true that firms' sales revenue decreased due to the tax increase, it must be the case that household spending on these excisable items decreased over that period. According to Uganda's National Household Survey of Fiscal Year 2016/17, monthly household spending on alcoholic beverages, tobacco, and narcotics – which cover most excisable goods – decreased by 40 percent; from a share of 2 percent in monthly household expenditure in the Fiscal Year 2012/13 to 1.2 percent in the Fiscal Year 2016/17. This timeframe covers the tax reform period. These alternative statistics, therefore, provide suggestive evidence that supports the results discussed in this chapter.

The results further suggest that the Ugandan government might not have registered any gains in tax revenue from the increases in excise tax rates implemented in the fiscal year 2015/16. If the objective was to reduce consumption at the expense of tax revenue, the results suggest that this aim was achieved. However, it would be surprising for a country with a low revenue relative to its GDP, and a stagnated tax to GDP ratio, to focus on reducing consumption of "sin" goods instead of increasing the revenue: If the objective is increasing revenue, as discussions with the officials from the Ministry of Finance suggest, then the excise tax increases in FY2015/16 did not have a positive impact on tax revenues. The government must have increased tax rates in FY2015/16 beyond the point where it can expect positive revenue gains. In other words, the increases in tax rates led to new rates that well above the optimal tax rates, which consequently resulted in lower tax revenues.

The other possible explanation is that treated firms might have the ability to shift their production to other excisable products that did not face a tax rate change. This not only minimizes the effect of the tax on firms' profits but also reduces the amount of tax revenue collected from treated products. The data discussed earlier in this section suggested that in FY2015/16, 15 treated firms exited and another 166 exited the following financial year, on the other hand, the comparison group firms increased by 3,339 in the FY2015/16 and another 382 in the following financial year. These data suggest treated firms could have exited the industry and opted for another line of

production that does not attract an excise tax, which might partly explain the significant decrease in government tax revenues. For firms that cannot substitute their production because they do not produce close substitutes and do not have the resources to invent new products, they may choose a lower level output when they have advance notice that their tax rates will change as predicted by the theoretical model in the conceptual framework. This will also contribute to a decrease in government tax revenue. It is possible that other firms can underreport their sales and production figures if the probability of detecting such behavior by the tax authority is very low. This behavior is likely because tax stamps – a mechanism of tracing and verifying production and sales numbers – have been proposed recently only by the Ugandan government. The lack of a tracing tool makes it difficult for the tax authority to verify the reported production and sales figures. In a tax system based on voluntary compliance, tax audits are critical to ensure that businesses report the accurate figures, which is a potential area for future research. However, with no precise verification mechanism, firms are likely to underreport their production and sales figures because the probability of detection is very low. This eventually results in lower, perhaps much lower, revenue when the tax rates are increased.

Underreporting may undermine the credibility of the estimates of firm behavior in this chapter, to alleviate some of these fears, section 5 of the Excise Duty Act of 2014, gives power to the Commissioner General of Uganda Revenue Authority to license premises that stores excisables and the Commissioner may rescind this license if the

taxpayer is not compliant. This legal provision gives the tax authority some leverage to compel the taxpayers to correctly report production and sales numbers. Nonetheless, underreporting will bias the results in this chapter away from zero; this implies that the (absolute value of the) effects of the increase in excise tax rates on firms' sales revenue and profits will be overestimated.

In addition, tax policy can ease the tax administrative burden by imposing a single tax rate for closely related products such as soft-cup and hinge-lid cigarettes or beer made from locally sourced raw materials and malt beer. Such improvements from the tax policy front may mitigate some of the negative effects on tax revenue that result from firms' ability to substitute production to avoid the tax. The next section provides concluding remarks.

2.7 Conclusion

It is a broadly accepted concept that imposing taxes that are not lump-sum generates a certain amount of deadweight loss. In most developing countries, tax policymakers' goal is to raise sufficient revenue to meet government expenditure needs while causing as minimal distortions to firms' operations as possible. This chapter's main objective was to estimate the impact of increases in excise tax rates on firms' sales revenue, profits and government excise tax revenues in Uganda. The results suggest that

the increases in excise tax rates in FY2015/16 resulted in an 11 percent and 20 percent decrease in firms' sales revenues for treated firms relative to comparison group firms in the first and second-year post-tax increase, respectively. Firm profits for treated firms also decreased by 27 percent relative to comparison group post-tax increase. With these arguably large declines in sales revenue and profits, the findings suggest that tax revenues from products whose tax rates were increased were 83 percent lower compared to excisables whose tax rates did not change. These results suggest that while policymakers might increase tax rates with the view of generating more tax revenue to finance budget deficits, the tax rates in Uganda might have been increased beyond what is optimal. In addition to not generating the intended tax revenue, firms tend to experience significant decreases in sales revenue and profits. Given that the magnitude of the effects of the excise tax changes on firm sales revenue and profits, and negative effects on government tax revenue, tax policymakers in Uganda should think about the optimality of the tax rates imposed on excisable goods

Note that excise taxes contribute only about 10 percent of the total tax revenue collected in Uganda. Changes in tax rates of the major contributors to tax revenue in Uganda, such as the Value Added Tax or Personal Income Tax rates, would have a larger effect on both firms' sales revenue and government tax revenues. Underreporting by firms to avoid tax payments is still problem that most tax authorities have to address, such behavior not only undermines efforts by governments to raise tax revenues but also

introduces bias in estimates that are based on the underreported data, which might result in misleading policy recommendations. Finally, mechanisms to track and trace production and sales declarations of excisable goods have recently been implemented in Uganda, providing options for further research into how firms might respond to tax policy changes within a (hopefully) more robust monitoring framework.

Table 2.9: Summary Statistics and Descriptions of Key Variables

Variables	Description		Mean	Std. Dev.	Min	Max	Observations
Log Gross Profit	The log of a firm's accounting profits, this is the difference between the sales revenue and cost of goods sold	overall	17.637	3.656	0	27.994	N = 60838
		between		3.201	0	27.914	n = 26798
		within		2.072	-0.839	33.583	
Log Sales Revenue	The log of sales revenue generated by firms from the sale of goods and services.	overall	19.365	2.111	0.693	28.237	N = 60838
		between		1.983	9.643	27.920	n = 26798
		within		0.517	7.268	25.589	
Log Depreciation Allowance	The variable captures the loss in value of capital equipment (wear and tear) at the end of every fiscal year. This variable shows the firm's capital structure, a firm that is capital intensive will have higher depreciation allowance.	overall	11.494	7.106	0	25.845	N = 60838
		between		6.929	0	25.622	n = 26798
		within		2.843	-7.785	27.394	
Log Financial Expenses	This variable captures expenses of a financial nature incurred in generating income, such as bank charges, interest payments, insurance, exchange rate losses and provision for bad debts. The variable captures the leverage of a firm.	overall	12.047	6.117	0	26.968	N = 60838
		between		5.966	0	25.599	n = 26798
		within		2.394	-4.579	30.662	
Log Employee Compensation	This variable captures the payroll size of a firm	overall	16.590	1.892	0	25.676	N = 60838
		between		1.767	0	25.584	n = 26798
		within		0.520	-0.150	26.113	
Taxes firms	This is a dummy variable that takes on a value of 1 if a firm faces	overall	0.073	0.260	0	1	N = 60838

	a change in the excise tax rate and 0 otherwise	between		0.238	0	1	n = 26798
		within		0.000	0.073	0.073	
After Fiscal Year 2015/16	This dummy variable takes on a value of 1 for years after FY201516, a financial year when excise tax rates were changed	overall	0.552	0.497	0	1	N = 60838
		between		0.367	0	1	n = 26798
		within		0.405	-0.248	1.302	
Time	This variable is a common time trend that takes on values 0,1, 2 and 3 for Fiscal Years 2013/14, 2014/15, 2015/16 and 2016/17, respectively.	overall	1.603	1.107	0	3	N = 60838
		between		0.860	0	3	n = 26798
		within		0.889	-0.397	3.403	
Log Excise Tax Revenue	This variable is the log of excise tax revenue that the Government of Uganda collects from all excisable goods	overall	21.312	1.376	15.320	23.918	N = 400
		between		1.949	16.829	23.343	n = 10
		within		0.385	19.515	23.153	

The summary statistics include both the comparison and treated group data. These data are considered accurate by the Ugandan tax authority until a tax audit proves otherwise; the assumption is that these data are true record of firms' economic activity Uganda. Notably, any errors in these data may greatly impact the results in this chapter. The firm-level data used in this study are from the Uganda Revenue Authority; restrictions apply to these data's availability and are not publicly available. Data can, however, be accessed with permission from the Uganda Revenue Authority or the Ministry of Finance.

Table 2.10: Summary Statistics and Descriptions of Key Variables after Matching on Covariates

Variables	Description		Mean	Std. Dev.	Min	Max	Observations
Log Gross Profit	The log of a firm's accounting profits, this is the difference between the sales revenue and cost of goods sold	overall	17.774	3.685	0	27.994	N = 48735
		between		3.153	0	27.914	n = 17953
		within		2.215	-0.702	33.720	
Log Sales Revenue	The log of sales revenue generated by firms from the sale of goods and services.	overall	19.548	2.137	0.693	28.237	N = 48735
		between		2.036	11.489	27.920	n = 17953
		within		0.547	7.451	25.772	T-bar = 2.714
Log Depreciation Allowance	The variable captures the loss in value of capital equipment (wear and tear) at the end of every fiscal year. This variable shows the firm's capital structure, a firm that is capital intensive will have higher depreciation allowance.	overall	11.933	6.920	0	25.845	N = 48735
		between		6.585	0	25.622	n = 17953
		within		3.035	-7.346	27.833	
Log Financial Expenses	This variable captures expenses of a financial nature incurred in generating income, such as bank charges, interest payments, insurance, exchange rate losses and provision for bad debts. The variable captures the leverage of a firm.	overall	12.560	5.903	0	26.968	N = 48735
		between		5.608	0	25.599	n = 17953
		within		2.523	-4.066	31.175	
Log Employee Compensation	This variable captures the payroll size of a firm	overall	16.720	1.919	0	25.676	N = 48735
		between		1.820	0	25.584	n = 17953
		within		0.552	-0.020	25.644	
Taxes firms	This is a dummy variable that takes on a value of 1 if a firm faces a change in the excise tax rate and 0 otherwise	overall	0.441	0.497	0	1	N = 48735
		between		0.254	0	1	n = 17953
		within		0.453	-0.359	1.191	

After Fiscal Year 2015/16	This dummy variable takes on a value of 1 for years after FY201516, a financial year when excise tax rates were changed	overall	0.087	0.282	0	1	N = 48735
		between		0.275	0	1	n = 17953
		within		0.000	0.087	0.087	

Table 2.11: Main results from Table 2.4, Table 2.5 and Table 2.7 with Bootstrapped Standard Errors

	(1)	(2)	(3)	(4)
	Log sales revenue		Log gross profit	
Taxed firms * After Fiscal Year 2015/16	-0.064**		-0.272***	
	(0.027)		(0.092)	
Taxed firms * One year after tax change		-0.113***		-0.364*
(t=3)		(0.038)		(0.207)
Taxed firms * Two years after tax		-0.201***		-0.611**
change (t=4)		(0.059)		(0.285)
Time Trend	0.073***	0.072***	0.049**	0.044**
	(0.006)	(0.005)	(0.020)	(0.020)
Taxed firms * Time Trend		0.054**		0.151
		(0.025)		(0.121)
Controls	Yes	Yes	Yes	Yes
Dummy variable for t=4	Yes	Yes	Yes	Yes
Firm-level fixed effects	Yes	Yes	Yes	Yes
Matching on covariates	No	No	No	No
Observations	60,838	60,838	60,838	60,838
R-squared	0.177	0.177	0.025	0.025
Number of clusters	26,798	26,798	26,798	26,798

Bootstrapped errors in parentheses and are clustered at a firm level: ***, **, and * denote the significance at the 1, 5 and 10 percent levels, respectively. The control variables are log depreciation expenses, log financial expenses, and log employee compensation.

Table 2.13 Excise Tax Revenues (in Billions of Uganda Shillings) by Excisable Products

Product	Tax rate changed	Average tax revenue before tax change	Average tax revenue after tax change	Percentage change in tax
Domestic				
Beer	Yes	145.55	188.10	29.2%
Cement	Yes	16.75	21.25	26.9%
Confectionaries	Yes	-	0.77	
cigarettes	Yes	14.62	11.78	-19.4%
furniture	Yes	-	0.14	
Sugar	No	12.57	29.33	133.3%
perfumes and cosmetics	No	7.95	8.74	10.0%
Drinking water	No	9.29	14.02	50.9%
Soft drinks (soda, juices)	No	65.69	83.50	27.1%
Spirits	No	49.75	75.03	50.8%
Imports				
Fuels	Yes	1,091.00	1,496.28	37.1%
Beer	Yes	27.14	25.37	-6.5%
Wine	Yes	17.80	16.64	-6.5%
Un-denatured spirits	Yes	68.23	63.79	-6.5%
Cigars	Yes	53.98	50.47	-6.5%
Cosmetics and perfumes	No	9.05	8.46	-6.5%
water and soft drinks	No	4.73	4.42	-6.5%
Others		78.54	73.42	-6.5%
Total without fuels		*581.62*	*675.21*	*16.1%*
Total		**1,672.62**	**2,171.48**	***29.8%***

Tax revenues for periods before tax change are averages for FY 2013/14 and FY2014/15, while tax revenues for periods after tax change are averages for FY 2015/16 and FY 2016/17

Chapter 3

Employment Growth and Firm Size in Uganda

3.1 Introduction

In many countries, protectionist policies are mostly driven by the argument that new and small firms are vulnerable and prone to market exit under stiff competition, and that such firms are crucial for innovation and net employment growth. In sub-Saharan Africa, however, little is known about within-country relationships between employment growth, firm size, and age. The main goal of this chapter is to estimate how net employment growth varies with firm size while taking into account firm age and firm-specific characteristics in Uganda. The estimates in this chapter are by no means causal but rather show an accounting process that identifies the category of firms that contribute the most to net employment growth. The main contribution is to guide the targeting of policy interventions by the Uganda government, whose causal effects can then be estimated.

Uganda's National Labor Force Survey (NLFS) for fiscal year 2016/17 estimates that Uganda at that time had a population of about 38 million people. The working age population (between the ages of 14 and 64 years) is estimated to be 19 million. In general, Uganda's population is very young, with 56 percent of the population below the age of 17 years, which points to a sizeable increase in the labor force in the near future. The 2016/17 NLFS also estimates that the employed population at that time was about 9 million, which implies that the employment to population ratio (proportion of the working-age population that is employed) is about 48 percent. This is higher than in some

North African countries, such as Egypt (39%), which recently experienced a decline in the rate due to the effects of the global financial crisis and civil unrest (Assaad et al, 2019).

The NLFS data also indicate that of the 9 million people, about 12.1 percent are in formal employment while about 86 percent are employed informally. The majority of people in formal employment are in the services industry, followed by production and then agriculture. It is therefore important to point out that the analysis in this chapter is based on business income tax returns data that cover only formal private sector firms. This means that the main analysis covers only formal employment.[14] Nonetheless, formal employment contributes significantly to tax revenue and is dominant in the tax and industrial development policies of most developing countries.

In Uganda, small and medium-sized businesses tend to attract attention from policymakers because of their potential to absorb a growing labor force and in turn stimulate economic growth. This provides a platform for such firms to lobby the government aggressively for tax incentives or protectionist policies. Of course, decisions around these policies ought to be backed by evidence since very little is known about which firms contribute the most to net employment growth in developing countries; this further speaks to the importance of the analysis in this chapter.

[14] Data from five waves of the Uganda Living Standards Measurement Study (LSMS) Surveys, which include both formal and informal sector enterprises, are used to complement the analysis based on formal sector firms only.

The question of which firms create jobs has been explored to a great extent in developed economies, but very little is known in the developing world, especially in Sub-Saharan Africa. The recent findings from developed economies, especially the United States, suggest that firm size does not matter in determining employment growth after controlling for firm age. Nonetheless, the study points to the importance of young businesses and startups in job creation (Birch, 1987; Davis, Haltiwanger and Schuh, 1996; Cabral and Mata, 2003; Neumark et al. 2011; Haltiwanger et al. 2013). It is, however, unknown whether the conclusions in developed economies carry over to developing countries, and more specifically to Uganda. The evidence presented in this chapter makes a contribution that closes this gap. More specifically, this chapter presents strong evidence that employment growth increases with firm size in Uganda, even after controlling for firm age and other firm-specific characteristics such as main economic activity. Employment growth is highest for large young firms. This result is rather contrary to recent developed country evidence, as discussed by Haltiwanger et al. (2013), and suggests that their conclusions do not necessarily carry over to developing countries. In addition, there is strong evidence that employment growth decreases with firm age for Ugandan firms. This is consistent with theoretical predictions that inefficient firms tend to exit over time while productive firms that prevail tend to adopt new technologies and substitute labor with capital, hence lower employment growth as firms mature (Jovanovic, 1982; Hopenhayn, 1992, Haltiwanger et al. 2013). The findings in this

chapter, therefore, imply that policy incentives targeting mature firms are likely to have very little impact on employment growth.

Uganda's corporate income tax regime provides many tax exemptions, such as income from the export of 80 percent of finished consumer and capital goods (for at least 10 years), and income from agro-processing. These exemptions may seem universal in that they should benefit firms of different sizes as long as they qualify, but to be able to add value and also export significant amounts of output, firms need to be relatively mature in terms of age. Moreover, such firms might also be destroying more jobs than they create. Despite large and mature firms being the major beneficiaries of such policy interventions, developing country evidence from Assaad, Kraft, and Yassin (2020) suggests that large Egyptian firms cannot generate sufficient jobs to absorb the excess labor supply. In addition, firms learn over time and may adopt a compensation strategy that is based on workers' effort to improve productivity. In the process of rewarding effort, the less efficient workers will be replaced (Lazear, 2000; Kraft and Assaad, 2018), which implies that jobs are being created and destroyed in the process. If firms replace less productive workers with productive ones over time, then employment growth decreases as firms mature. This is indeed true for Ugandan firms, since the evidence in this chapter suggests that employment growth decreases with firm age.

Additional evidence on the effect of firm size on employment growth in developing countries is largely based on cross-country evidence, which does not reveal the within-country heterogeneous effects. More specifically, Ayyagari et al. (2014) used the World Bank's enterprise survey data from 104 countries and found that, while small firms have the smallest share of aggregate employment, they are responsible for the highest share of job creation. In contrast, the findings in this chapter suggest that even though large firms destroy many jobs, they are responsible for the largest share of job creation in Uganda.

The literature on gross job flows uses the number of employees both to construct employment growth rates and to measure firm size (Davis, Haltiwanger, and Schuh, 1999; Haltiwanger et al. 2013 and Ayyagari et al. 2014). However, data on number of employees are not available in the business income tax returns dataset. For this reason, this chapter uses employee compensation data to construct employment growth rates and deciles of firm size. It can be argued that high employee compensation may not necessarily mean that firms are hiring more workers, but rather paying higher wages to a few productive workers; Kraft and Assaad (2018) present evidence from Egypt which suggests that high wages may simply reflect an improvement in productivity and not necessarily an increase in employment. It should be noted, however, that employee compensation may be correlated with employment growth because the position of an employer in the overall wage distribution is unlikely to change much over a short period.

It seems, therefore, that the growth rate of pay reflects a change in employment over a short period.

The remaining sections of this chapter are organized as follows; Section 3.2 presents a conceptual framework, Section 3.3 describes the data and provides descriptive statistics, Section 3.4 discusses the empirical framework, Section 3.5 presents the results, and then a conclusion is provided in section 3.6.

3.2 Conceptual Framework

The Employment-population ratio, which shows that the proportion of the working-age population that is employed, is always reverted to if unemployment and labor force participation rates send mixed signals of employment growth. The employment-population ratio can be written as: $\frac{E_t}{P} = \frac{L}{P} * \frac{E_t}{L}$ where L is the size of the labor force (employed plus the unemployed (U_t)); P is the size of the working-age population; and E_t is the employed population.

According to the "bathtub" model of unemployment (Hall, 1979), a change in unemployment can be written as $\Delta U_{t+1} = sE_t - fU_t$; where $s\ and\ f$ are the job separation and job finding rates, respectively. During the "steady-state", there still exists

unemployment because firms incur both hiring and firing costs, and also because individuals may delay accepting job offers with the hope of receiving better ones.

However, if the number of people losing jobs equals the number of people finding them, which implies that $\Delta U_{t+1} = sE_t - fU_t = 0; \ \Rightarrow U_t = \frac{sE_t}{f}$, and since $L = E_t + U_t, \Rightarrow L = E_t + \frac{sE_t}{f}$ the expression then simplifies to the employment rate $\frac{E_t}{L} = \frac{f}{s+f}$. Substituting the employment rate into the employment-population ratio, it can be observed that $\frac{E_t}{P} = \frac{L}{P} * \left(\frac{f}{s+f}\right)$. Since the size of the labor force as a proportion of the working-age population $\left(\frac{L}{P}\right)$ does not change very often, I assume that over short periods of time, it does not change very much, and is equal to some constant α, such that $\frac{E_t}{P} = \alpha\left(\frac{f}{s+f}\right)$. From this expression, changes in the employment-population ratio are determined by changes in the job finding and/or separation rates. An increase in the job-finding rate will increase employment, while an increase in the job separation rate will decrease employment. Assuming that the working-age population is constant over short periods of time and that there are no other shocks to the labor market, the employment growth rate will depend on changes in both the job finding and separation rates.

The government may put in place policies to provide incentives for job creation which may improve the job-finding rate and in turn affect employment growth. On the other hand, firms may invest in technology to help them find better matches on the job

market, which over time may minimize job separation rates. Therefore, in the process of incentivizing job creation by governments (such as providing tax breaks) and improving matches by firms, employment growth may be altered. Theoretically, the parameters that change employment growth rates are clear. But, the question of which firms (small, large, young, or mature) are responsible for what employment growth rates (high or low) is an empirical one, and it is investigated in the next sections of this chapter.

3.3 Data and Descriptive Statistics

The analysis in this chapter is based on a business income[15] tax returns' panel dataset from Uganda, averaging 12,197 returns per fiscal year for nine fiscal years (FY 2009/10 to FY 2017/18). Over these fiscal years, there are a total of 109,772 business income tax returns. About 60.8 percent (66,786) of the returns belong to firms that still exist, while about 39.2 percent belong to firms that have exited, of which 94.3 percent (40,534) returns are assigned to the small taxpayers' office within the tax authority; these are returns for small firms.

[15] Business income is defined under Section 18 of Uganda's Income Tax Act Cap 340 to mean any income derived by a person in carrying on a business. A person is further defined to include an individual, a partnership, a trust, a company, a retirement fund, a government, a political subdivision of a government and set of listed institutions. As long as a person as defined by the Income Tax Act, files a tax return, this person's data are included in the analysis.
It should be noted that these data are non-public; they are from the electronic returns filed with the Uganda Revenue Authority, which is Uganda's semi-autonomous agency responsible for tax collection. Data can, however, be accessed with permission from the Uganda Revenue Authority and the Ministry of Finance.

The business income tax returns dataset includes variables such as: gross sales, cost of goods sold, total employee compensation (payroll expenses of a firm), age of a firm (the time when a firm first registered for taxes), financial expenses, depreciation allowances, gross profits, corporate income tax expenses, an indicator of whether a firm is classified as large, medium or small by the tax authority, and economic activity/sector of a firm. Nonetheless, the key outcome variables are employment growth, job creation, and job destruction, which are constructed from total employee compensation. The key explanatory variables of interest are average firm size and age class of a firm, which are constructed using total employee compensation and firm age, respectively. The mechanics of how these variables are constructed is discussed in detail in the next paragraphs and/or sections.

The literature on gross job flows uses the number of employees to construct employment growth rates (Davis, Haltiwanger, and Schuh, 1999; Haltiwanger et al. 2013 and Ayyagari et al. 2014). However, the position of an employer in the overall wage distribution is unlikely to change over a short period of time. Thus, *changes* in employee compensation should reflect *changes* in employment. Firms annually report basic salary paid to employees and other employee compensation, such as contributions to social security, health insurance benefits, and bonuses. Including contributions to social security may reflect changes in the contribution rates, which is 15 percent in Uganda, with 10 percent contributed by the employer and 5 percent by the employee. These rates have not

changed since the establishment of the National Social Security Fund in 1985 (NSSF Act. Cap. 222), so including these contributions does not affect (percentage) changes over time in employee compensation.

In addition, bonus payments may reflect recent success in the firm and not changes in employment. However, not including bonus payments ignores small firms that do not have a pay structure but use bonus payments as a compensation mechanism for their employees. Total employee compensation will, therefore, capture changes in the payroll of a firm over the year, which is generally not used when the data on the number of employees are available as a measure of job creation or destruction. In particular, if a firm lays off a worker at the beginning of the year and hires another towards the end, the number of employees will remain the same for that year, which looks like no job was destroyed or created.

In contrast, payroll expenses allow one to observe when firms spend less on wages and salaries for the months between laying off one worker and hiring another; which in a way makes the use of payroll expense a better measure for job creation and destruction. It should be noted that, if the difference between total employee compensation in period t and t-1 is greater than zero, jobs are created, else it is job destruction. Note, however, that this is “net” job creation and destruction, not “gross”.

Note that employee compensation data from tax returns are in nominal terms; this means that these data include the effects of both inflation and productivity growth. Ideally, compensation would be deflated by a wage index, but such an index is not available for Uganda. Instead, the Consumer Price Index is used to deflate the employee compensation data to minimize bias in employment growth, to avoid the growth rates being biased upwards in periods of positive inflation.

Another limitation to using payroll data is that these data capture only firms that file tax returns. Thus, jobs created/destroyed by firms that operate in the informal sector are not captured in the analysis; hence the results in this chapter are limited to formal firms and may not necessarily hold for informal sector firms. However, the vast majority of large firms are in the dataset, since they are easy to detect in a relatively small economy due to the aggressiveness of the tax administration.

In addition, the penalties and interest that accrue from defaulting on taxes are relatively high in Uganda, which should compel businesses to comply and register for taxes. Much smaller firms that are typically sole proprietorships with one or two employees may successfully operate informally, but the focus in this chapter is only on the formal sector, where jobs pay higher wages. This does not in any way downplay the role of the informal sector in absorbing excess labor, since large firms may not have the ability to absorb all the labor (Assaad, Kraft, and Yassin, 2020). In fact, the Uganda

Bureau of Statistics, with support from the World Bank, has conducted five waves of the Living Standards Measurement Study Survey, which is a household survey that provides some data on formal and informal enterprises of surveyed households. The survey is nationally representative, and the number of enterprises included in the survey per wave is in Table 3.1.

Table 3.1 shows that most of the enterprises both formal and informal are have one employee per month. On average, 80 percent of all household enterprises do not have any employees. The LSMS data do not include the large formal sector firms (the tax returns data capture these) which are responsible for most of the formal employment growth in Uganda.

Table 3.1: Number of Enterprises and Employees per Wave of the Living Standards Measurement Study (LSMS) Survey

	Informal Sector		**Formal Sector**	
Fiscal year of survey	Enterprises	No. of monthly employees	Enterprises	No. of monthly employees
2009/10	1,746	1,716	95	87
2010/11	1,453	1,449	76	75
2011/12	1,391	1,387	87	87
2013/14	1,551	1,550	125	125
2015/16	1,668	1,654	133	127
Total	**7,809**	**7,756**	**516**	**501**

An enterprise is said to be informal if it reported that it was not registered for either income taxes or value added taxes during the fiscal year of the survey. Note that only 20 percent (1,662) of the enterprises have complete records. The survey makes an effort to follow the same households in each survey year and some new households are usually added in each wave.

The complete records from the LSMS survey allow for the construction of the key variables of interest such as employment growth, job creation, job destruction, firm size as measured by the monthly number of employees in these data, and enterprise age. Of the 1,662 enterprises with complete records used in the analysis, about 90 percent are informal, and 10 percent are formal. These data are used to check the robustness of the findings from business income tax returns data.

From the tax returns data, total employee compensation is used to construct the average firm size, which is simply the average of total employee compensation between periods t and $t-1$. Constructing average size in this manner should be robust to changes in size as a result of changes in ownership since it captures actual changes in the level of economic activity that a firm is involved in (Haltiwanger et al. 2013). The average size is constructed for the 69.5 percent (76,315) of the returns that report some form of employee compensation. Dummy variables are then created which categorize firms into firm size quintiles; each quintile includes about 20 percent of the returns, with the smallest firms in the first quintiles and largest firms in the fifth quintile. To check the robustness of the findings in this chapter, firm gross income is also used to construct an alternative measure of firm size quintiles.

The dataset also includes the date that a firm was first registered for taxes, which is used to measure the age of the firm. A business that registers formally with the register

of companies in Uganda is assigned a tax identification number relatively quickly and is required to file a tax return at the end of that tax year, hence the date that a firm first registers for taxes closely approximates the year that a firm is incorporated.

A firm is considered to have exited if a tax return is filed only for earlier fiscal years in the data. Since firms have a unique identifier, the tax returns can be traced over time, which makes it possible to observe a firm that does not file a return in subsequent years. Firms that file their first tax return in the latest year of data are likely to have been in operation for a couple of months during that tax year and they constitute firm births; effectively, such firms will have been in operation for less than a year and they are not included in the analysis. Firms between 1 and 10 years are referred to as young firms and firms above 10 years are considered to be mature firms. About 32.9 percent of the returns belong to mature firms and 58.6 percent to young firms, which indicates that the majority of Uganda's firms have been in operation for less than 10 years. The rest of the firms are firm births.

To further explore the data, the age of a firm is categorized into age classes; which are essentially used as dummy variables for the age of a firm. The age classes include; 0; 1 to 2; 3 to 5; 6 to 10; 11 to 15; and 16+ years: These age classes are meant to capture how employment growth changes as firm age. The distribution of firms by age class and quintiles of firm size for fiscal year 2017/18 is shown in Table 3.2.

Table 3.2: Distribution of Firms by Age Class and Quintiles of Firm Size for FY 2017/18

Age class (years)	Quintiles of Firm Size						
	First	Second	Third	Fourth	Fifth	Total	%
0	8	7	8	13	11	47	0.4%
1 to 2	318	317	301	213	100	1,249	9.7%
3 to 5	812	805	874	767	492	3,750	29.1%
6 to 10	686	712	784	898	772	3,852	29.9%
11 to 15	158	193	249	377	411	1,388	10.8%
16 +	348	366	415	537	937	2,603	20.2%
Total	2,330	2,400	2,631	2,805	2,723	12,889	

Each row in Figure 3.2 above corresponds to an age class and each column a quintile of size. Each cell, therefore, shows the number of firms that correspond to a particular age class and size. The last column shows the share of firms in each class.

Table 3.2 shows that the largest group of the firms (29.9%) had been in operation for 6 to 10 years by fiscal year 2017/18, which is the last year of study in dataset. About 69.1 percent of the firms had been in operation for 10 years or less. It is also clear that 20.2 percent of firms had been in operation for at least 16 years. These summary statistics suggest that majority of the firms in Uganda are young. If these firms survive long enough, they could potentially be the key to absorbing the young yet rapidly growing labor force in Uganda. The empirical strategy and construction of the employment growth rates are discussed in the next section.

3.4 Empirical Framework

In this chapter, the relationship between employment growth, firm size, and firm age is estimated following closely the approach used by Haltiwanger et al. (2013) in determining who creates jobs in the United States. Ordinary Least Squares is used to estimate an all dummy variable model, that is, employment growth is regressed on dummies for firm size, age classes of a firm and the interaction between the two sets of dummies, industry-specific dummies are later added to assess whether the relationship persists. These all-dummy-variable models are said to be general regardless of the distribution of the dependent variable and tend to yield very similar conclusions with and without interaction terms of firm size and firm age, and controls for industry-specific characteristics (Angrist and Pischke, 2008; Davis et al. 2010).

The estimation equation is given by equation (3.1):

$$g_{it} = \alpha + \delta Size_{it} + \sigma Age_{it} + \sum_{j=1}^{5}\sum_{k=1}^{5} \beta_{jk} Age_{it} Size_{it} + \boldsymbol{\lambda_s} + \varepsilon_{it} \qquad (3.1)$$

where g_{it} is the employment growth rate for firm i at time t. It is constructed based on the approach of Davis, Haltiwanger, and Schuh (1996). It is referred to as the DHS growth rate and is now the standard in the literature on the analysis of firm dynamics (Haltiwanger et al. 2013). The DHS growth rate is defined as;

$$g_{it} = \frac{(E_{it} - E_{it-1})}{Size_{it}} \qquad (3.2)$$

where $Size_{it} = \frac{1}{2} * (E_{it} + E_{it-1})$, which is the average size of firm i at times t and $t-1$, and

E_{it} and E_{it-1} are the total employee compensation by firm i at time t and $t-1$, respectively. The variable g_{it} is included in equation (3.1) as a vector of dummy variables for firm size. Age_{it} is a vector of age class dummy variables for firm i at time t. $Age_{it}Size_{it}$ is a vector of interaction terms of firm size dummies and age class dummies, and $\boldsymbol{\lambda_s}$ is a vector of industry-specific dummy variables, that control for time-invariant industry specific characteristics. The error term for firm i at time t, ε_{it}, captures unobserved time-varying firm-level characteristics.

From the way employment growth is constructed, regressing this variable on the average size measure will result in an inverse relationship which might be misleading, hence the adoption of an all dummy variable model approach (Davis, Haltiwanger, and Schuh, 1996; Neumark, Wall and Zhang, 2011). The DHS growth rate is referred to as the standard measure in the literature since it accommodates firm entry and exit and captures "pure" growth in firm employment and not changes in the payroll resulting from mergers and acquisitions. In addition, firm size dummies are based on the average of total employee compensation between two periods, which is robust to temporary shocks to employment as compared to using compensation in either period, which is prone to bias (Mortensen and Pissarides, 1994; Haltiwanger et al. 2013). For the same reason, the

alternative measure of firm size that uses gross income to construct firm size dummies is also based on two-year averages of gross income.

One concern with how employment growth is constructed is that if the changes in employment have some random measurement errors in them, smaller firms will tend to have lower increases in employment than larger firms. This is because firms that randomly get assigned negative changes in employment will be somewhat smaller than those that randomly get assigned positive changes. This will occur even when no relationship exists between employment growth and firm size. A positive correlation between employment growth and firm size might be observed but purely because there is some random measurement error in changes in employment growth. One way to check whether the relationship between employment growth and firm size is not purely driven by measurement error is to define firm size only in terms of the t-1 time periods. Therefore, equation (3.1) is re-estimated but with firm size defined in terms of the t-1 time periods, that is $Size_{it} = E_{it-1}$. The results from this robustness check are discussed later in the chapter.

Equation (3.1) is also estimated separately for firms that are in wholesale and retail trade, accommodation and food service activities, construction, and financial and insurance activities, in order to ascertain whether similar patterns are observed in these four sectors.

If the results from estimating equation (3.1) show a pattern, then there must be a strong effect of firm size (total employee compensation and gross income) on employment growth. If employment growth increases with firm size, then it must be that more jobs are created by larger firms, even if they might destroy some jobs as well. The estimation equation to estimate the effect firm size on employment growth is given by equation (3.3):

$$Y_{it} = \alpha + \beta X_{it} + \gamma_i \boldsymbol{Z}_{it} + \boldsymbol{\lambda}_s + \mu_{it} \quad (3.3)$$

where Y_{it} is the employment growth for firm i at time t. X_{it} is total employee compensation for firm i at time t; $\boldsymbol{\lambda}_s$ is a vector of industry-specific dummies that control for time-invariant industry specific characteristics; and μ_{it} is the residual for firm i at time t.

$\boldsymbol{Z}_{it}$ is a vector of time-varying firm specific characteristics that are correlated with the outcome variables of interest. The variables in $\boldsymbol{Z}_{it}$ include: firm age; depreciation – which captures the capital intensity of firm, a higher depreciation allowance implies that a firm invests more in physical capital; financial expenses – which account for the leverage of a firm. The standard errors are clustered at the firm level. The process described above is repeated when employment growth is regressed on an alternative measure of firm size (gross income) to check for consistency of results across different measures of firm size. It should be noted that the estimates here are by no means intended

to be estimates of causal relationships, but rather they measure the robustness of the correlation between employment growth and firm size. The next section of the chapter discusses results from the analysis.

3.5 Results and Discussion

3.5.1 Net Employment Growth and Firm Size

Ordinary Least Squares is used to estimate equation (3.1). The results from this specification can best be interpreted using graphs. Figures 3.1 and 3.2 show the expected value of employment growth as the firm size category changes while holding constant firm age and its interaction with firm size. In addition, the relationship between employment growth and firm age, while holding constant firm size, is also explored (see Figure 3.4). Note that these relationships are not causal but rather an accounting process that shows which types of firms contribute most to employment growth in Uganda.

Figure 3.1 presents three different specifications that show the expected value of employment growth for different firm sizes. Specification (1) is a regression of employment growth on firm size dummies, and then dummies for firm age are added as a control in the specification (2). Finally, interaction terms between firm size dummies and

firm age dummies, and industry-specific dummy variables are added in the specification (3).

Figure 3.1: Employment Growth and Firm Size (Employee Compensation)

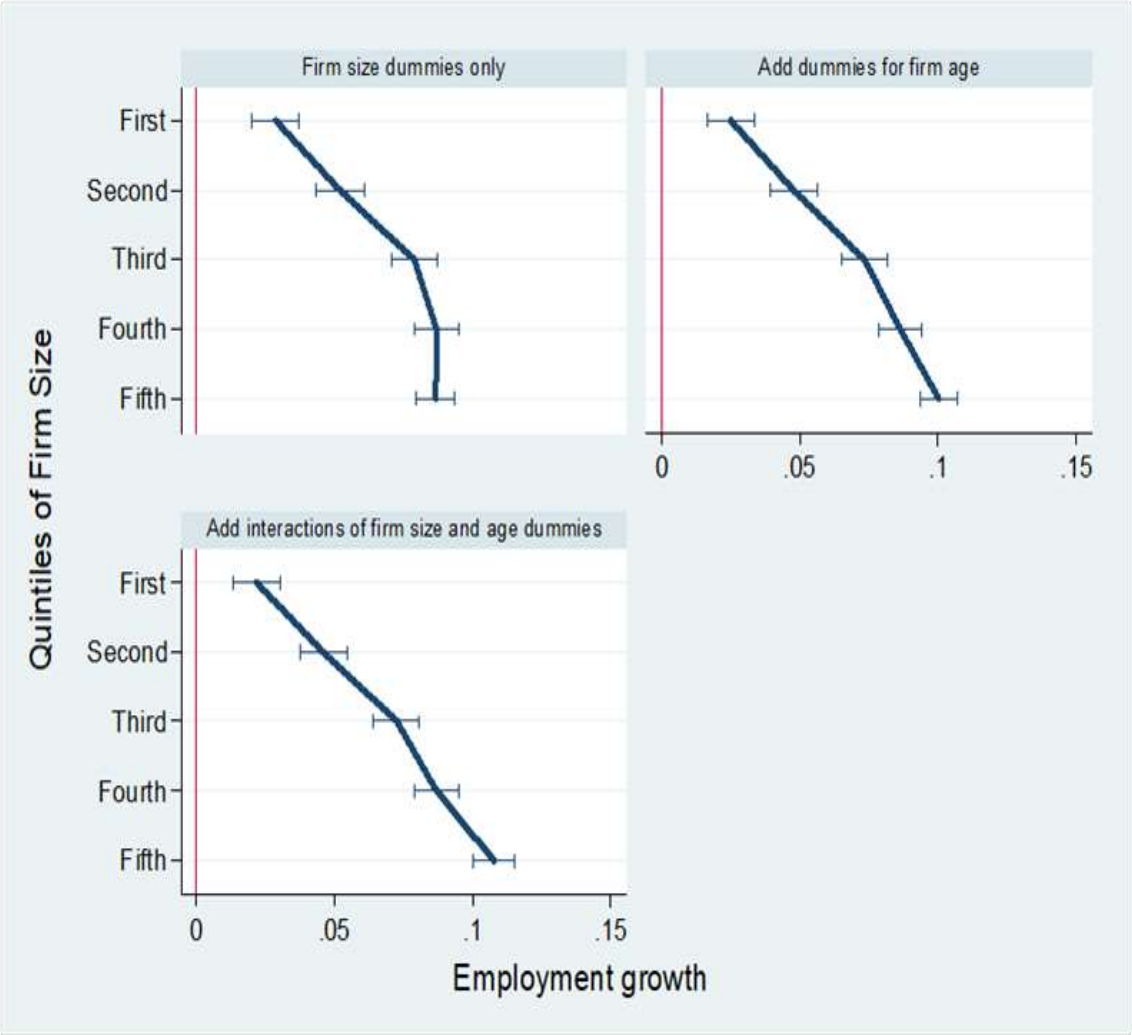


Figure 3.1 shows how employment growth changes with firm size. Note that the first quintile has the smallest firms and the fifth has the largest firms. Employee compensation numbers are deflated using the Consumer Price Index. The bands are the 95 percent confidence intervals around each expected employment growth value. The horizontal and vertical axes are the same in all the three specifications figures.

Figure 3.1 shows that, in the first quintile, employment growth averages at about 3 percent in all specifications. Employment growth then increases by about 2 percentage points to an average of 5 percent in the second quintile. The rate then increases to 7 percent and then 8.6 percent in the third and fourth quintiles respectively. According to these deflated figures, employment growth peaks at 10 percent in specifications (2) and (3) and is highest in the fifth quintile.

Given the observed employment growth rates in Figure 3.1, one can conclude that employment growth is positively correlated with firm size in Uganda; the correlation persists even after controlling for firm age and industry-specific time invariant characteristics. In fact, the correlation gets stronger after controlling for firm age. The results suggest that holding firm age constant, formal employment growth is highest in the largest firms in Uganda.

To check the robustness of the above results to different measures of size, the firm's gross income is used as an alternative measure of firm size, and the results are presented in Figure 3.2. Figure 3.2 presents the same specifications as Figure 3.1 but using the alternative measure of firm size. Figure 3.2 shows that employment growth is negative and statistically significant at the 5 percent level in the first quintile, the rate is -1.4 percent in specification (1) without any controls, increases in absolute terms to -1.65 percent when firm age is added in specification (2) and then to -2.4 percent in

specification (3) – which includes interaction term for firm size and firm age dummies, and industry-specific dummies. This result suggests that firms in the first quintile, which are the smallest firms, may not have a meaningful impact on formal employment growth, which is not very surprising. This is because firm-exit might be high among formal small firms in Uganda; that is, 94.3 percent (40,534) of tax returns for exited firms were from the small taxpayers' office. Note that these firms might not necessarily shut down but rather operate informally.[16]

Figure 3.2: Employment Growth and an Alternative Measure of Firm Size (Gross Income)

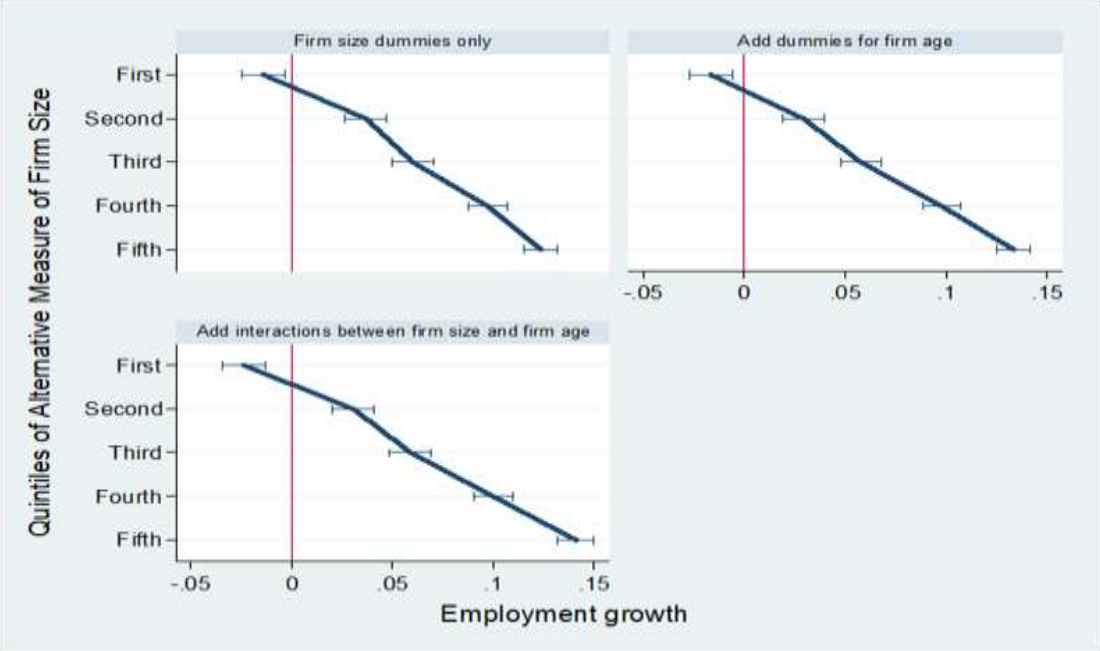


Figure 3.2 shows how employment growth changes when quintiles of gross income are used as a measure for firm size. Specification (1) is a regression of employment growth on firm size dummies, then dummies for firm age are added as a control in the specification (2) and finally, an interaction term between firm size and age, and industry-specific dummies are added in the specification (3). The first quintile has the smallest firms and the fifth has the largest firms. The bands are the 95 percent confidence intervals around each expected employment growth value.

[16] Later in this section of the chapter data from the Uganda Living Standards Measurement Surveys that include both formal and informal sector enterprises are used to check the robustness of these results.

Nonetheless, employment growth is on average, 3 percent in the second quintile, and this is significant at the 5 percent level. Employment growth then peaks in the fifth quintile at rates of 12.3 percent, 13.3 percent and 14.1 percent in specifications (1), (2), and (3), respectively. As in Figure 3.1, the results presented in Figure 3.2 show a positive correlation between employment growth and firm size. This positive correlation is robust to alternative measures of firm size in Uganda – supporting the earlier result that, holding firm age constant, the expected rate of employment growth is highest for large firms.

To investigate the result further, specification (3) of both Figure 3.1 and Figure 3.2 is estimated for select industries that have enough observations in the data to allow for industry-specific estimation. These industries are construction, wholesale and retail trade, finance and insurance, and accommodation and food services.

The results are presented in Figure 3.3, which again shows a positive relationship between employment growth and firm size. Firms in the first quintile, regardless of industry, register either negative employment growth or growth rates that are not statistically significant – this further supports the earlier result that small formal firms may not have a meaningful contribution to employment growth. The highest employment growth rates are registered by firms in the fifth quintile. Among the four industries examined, accommodation and food services, and construction have the highest growth rates. Overall, these results suggest that, holding firm age constant, the largest firms

contribute most to formal employment growth in Uganda. In addition, the accommodation and food services sector and the construction sectors contribute the most to formal employment growth in Uganda.

Figure 3.3: Employment Growth and Firm Size for select Industries with Quintiles of Size Constructed from both Employee Compensation and Gross Income

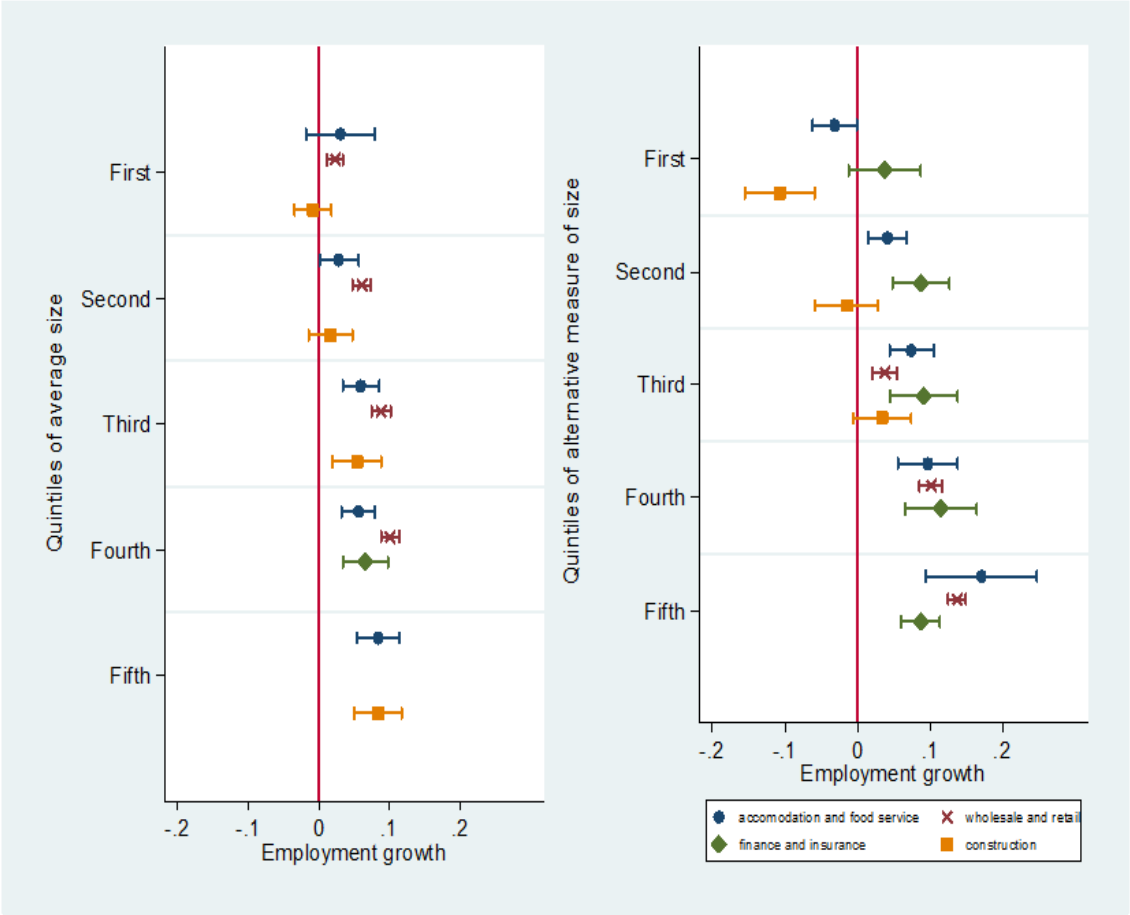


Figure 3.3 above shows industry-specific results (at least for industries that the results could be estimated) of the relationship between employment growth and firm size. Employment growth (deflated) is regressed on quintiles of size and interaction with age class to generate the results plotted in this figure. In the graph to the left, employee compensation is used to construct quintiles of size, while the one on the right uses gross income (alternative measure). Firms in the finance and insurance sector may pay similar wages hence they end up in one quintile when employee compensation is as a measure of size. On the other hand, such firms are likely to differ in gross income, hence the classification in different quintiles when gross income is used as a measure of size.

3.5.2 Net Employment Growth and Firm Age

Jovanovic (1982) suggests that firms within a particular industry learn about their efficiency as they operate, and that the efficient firms survive while the inefficient fail and exit the industry. The learning process certainly happens over time, and firms become mature in the process. It is therefore possible that firms will start with relatively higher employment as they learn the operations within industry and over time downsize to an efficient level. To check this, I investigate how employment growth changes with firm age in Uganda.

The results from this investigation are presented in Figure 3.4, where specification (1) is a regression of employment growth on firm age only, specification (2) adds firm size, and its interaction dummies with firm age, as controls, and finally, industry-specific dummies are added in specification (3).

Figure 3.4 shows that employment growth decreases with firm age in all three specifications. Comparing firms that have been in operation for up to two years to those that have operated from three to five years, the decline is from as high as 40 percent in specifications (2) and (3) to about 16 percent, this is a decrease of about 24 percentage points. Employment growth then falls by 6 percentage points, to an average of 10 percent across the three specifications, for firms that have been in operation for up to 10 years. For firms that have operated for 11 to 15 years, employment growth averages at about 4

percent. Finally, firms that have been firms that are 16 or more years have the lowest unemployment growth rate, about 2 percent.

Figure 3.4: Employment Growth and Firm Age

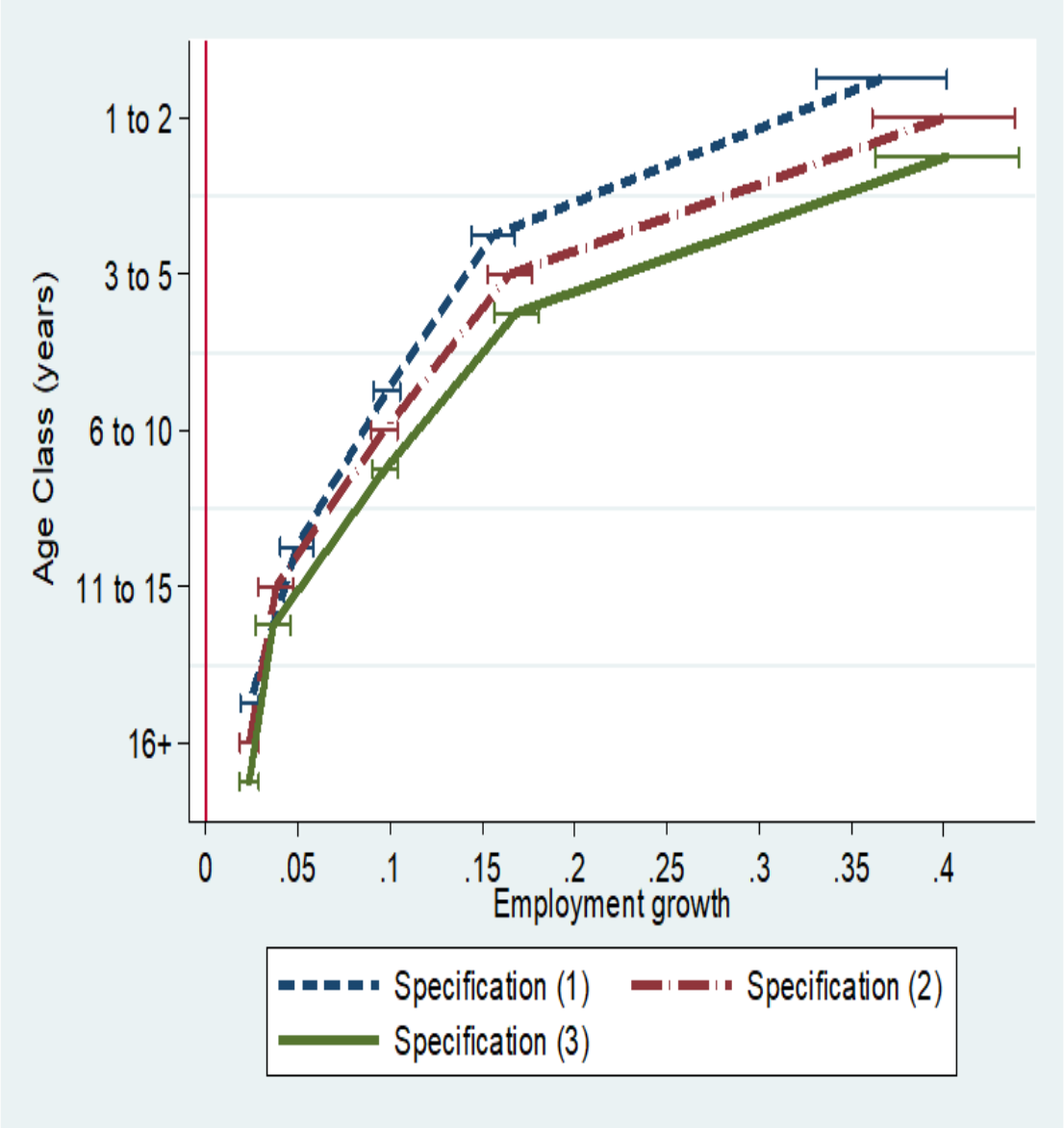


Figure 3.4 shows how employment growth changes with firm age while holding other firm-specific characteristics constant. Specification (1) shows results without any controls, specification (2), includes controls for firm size and its interaction with age and specification (3) includes industry-specific dummies which control for time-invariant industry specific characteristics.

The discussion above shows that the relationship between employment growth and firm age is negative for Ugandan formal sector firms. This implies that young firms have higher employment growth rates than mature firms. The relationship between employment growth and firm age also persists after controlling for firm size and time-invariant industry-specific characteristics. These results are consistent with those for United States firms, and with the theory that firms tend to learn over time and inefficient firms that cannot keep up will exit. On the other hand, efficient firms tend to prevail and may adopt new technologies that allow them to substitute labor with capital, hence lower employment growth for mature firms (Jovanovic, 1982; Hopenhayn, 1992, Haltiwanger et al. 2013).

The takeaway from the discussion above is that young firms may be vulnerable to exit if they are not efficient, regardless of size. Mature firms tend to have low and stable employment growth since over time they figure out their employment needs. Even though young firms – which most researchers and policymakers may mistake for small – have high employment growth numbers, these tend to decrease quite quickly as firms mature. It could be that firms become efficient and figure out their employment needs, but it is also likely that firms fail significantly and exit within the first five to ten years of operations. The overall conclusion of this analysis of employment growth, firm size and firm age for Ugandan formal firms is that formal employment growth is highest for large yet young firms.

Figure 3.5: Employment Growth and Firm Age for select Industries with Quintiles of Size constructed from Employee Compensation

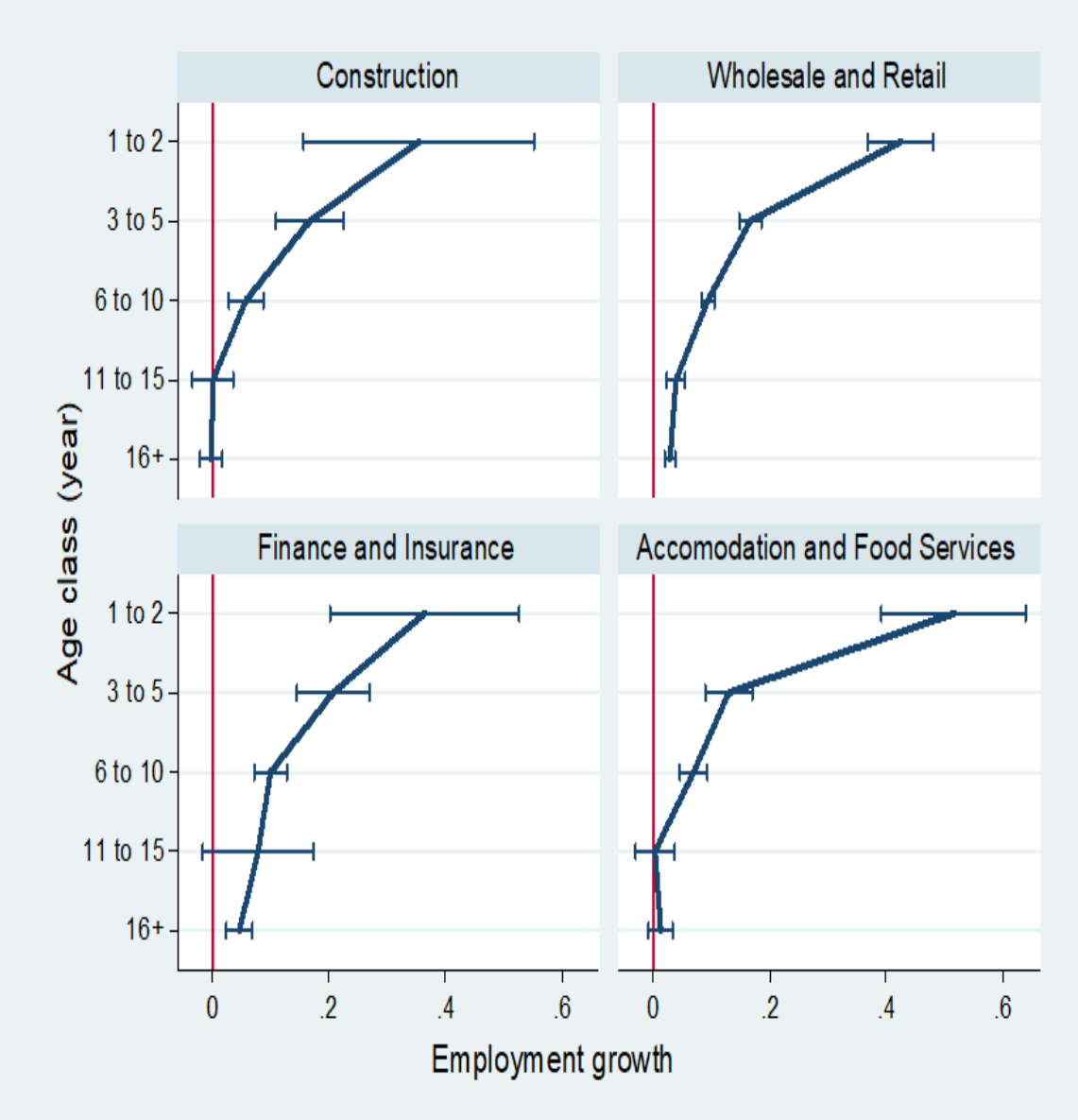


Figure 3.5 above shows industry-specific results (at least for industries that the results could be estimated) of the relationship between employment growth and firm age. Employment growth (deflated) is regressed on firm age and its interaction with quintiles of size constructed from employee compensation (deflated). The number of observations per industry include; Construction (6,888); Wholesale and retail (26,653); Finance and Insurance (3,649); Accommodation and food services (4,955).

Industry-specific relationships between employment growth and firm size are also investigated using deflated employee compensation, and the results are presented in Figure 3.5. The sectors that are investigated are: construction, wholesale and retail trade, finance and insurance, and accommodation and food services. In all four sectors, employment growth rate is highest for younger firms; the rates then decrease steeply for firms between 1 and 10 years of operation and tend to stabilize at lower rates for more mature firms. For construction, and for accommodation and food services industries, mature firms (10+ years) have an employment growth that is close to 0 percent and is not statistically significant. The wholesale and retail industry shows low and stable statistically significant employment growth rates for mature firms.

Using gross income to control for firm size as opposed to employee compensation shows similar results – these results are presented in Figure 3.6. From the industry-specific results, the negative relationship between employment growth and firm age observed in all formal Ugandan firms is also observed in selected sectors, such as construction, wholesale and retail trade, finance and insurance, and accommodation and food services.

Figure 3.6: Employment Growth and Firm Age for select Industries with Quintiles of Size Constructed from Gross Income

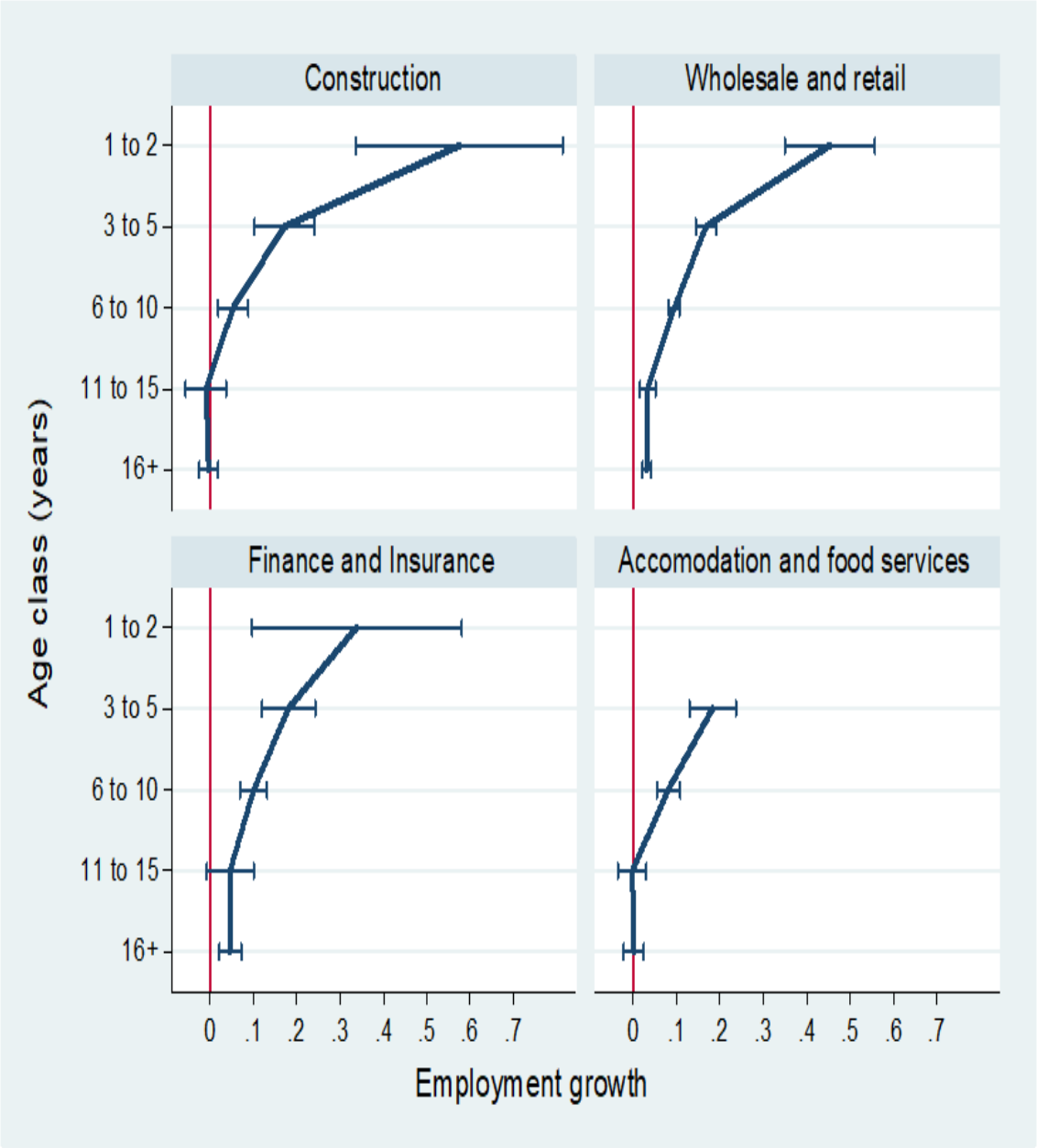


Figure 3.6 above shows industry-specific results (at least for industries that the results could be estimated) of the relationship between employment growth and firm age. Employment growth (deflated) is regressed on firm age and its interaction with quintiles of size constructed from gross income.

3.5.4 Additional Checks

To check the robustness of the results from the all dummy variable specification, equation (3.3) is estimated. Specifically, employment growth is regressed on the log of employee compensation while controlling for firm age and other firm-specific characteristics as shown in panel A of Figure 3.4. Panel B shows results that use total gross income as a measure of firm size instead of employee compensation. If indeed the positive correlations discussed in the earlier sections of the chapter are robust, then an increase in either employee compensation or gross income should be associated with an increase in employment growth.

In specification (1) of Table 3.3, employment growth is regressed on log employee compensation. Then, specification (2) controls such as firm age, depreciation (which captures the capital intensity of firm), financial expenses (which account for leverage). Finally, specification (3) adds year-specific dummies to account for macro-economic shocks and industry-specific dummies to control for common within industry behavior regarding employee compensation. Panel A shows that employee compensation is positively correlated with employment growth. In particular, from specification (3), a 10 percent increase in employee compensation is associated with a 0.9 percentage point increase in employment growth.

Table 3.3: The effect of firm size and firm age on firm employment growth

	Employment growth		
	(1)	(2)	(3)
Panel A:			
Log employee compensation	**0.059*** **	**0.084*** **	**0.091*** **
	(0.002)	**(0.002)**	**(0.002)**
Age of a firm in years		**-0.013*** **	**-0.014*** **
		(0.000)	(0.000)
Log depreciation expense		-0.023***	-0.023***
		(0.002)	(0.002)
Log financial expenses		-0.024***	-0.029***
		(0.002)	(0.002)
Constant	-0.902***	-1.077***	-1.172***
	(0.027)	(0.028)	(0.181)
Year specific dummies	No	No	Yes
Industry-specific dummies	No	No	Yes
Observations	50,467	50,467	50,467
R-squared	0.038	0.064	0.073
Panel B: Uses an alternative measure of size			
Log total gross income	**0.027*** **	**0.033*** **	**0.036*** **
	(0.001)	**(0.001)**	**(0.001)**
Age of a firm in years		**-0.010*** **	**-0.011*** **
		(0.000)	(0.000)
Log depreciation expense		0.004**	0.003
		(0.002)	(0.002)
Log financial expenses		-0.002	-0.002
		(0.002)	(0.002)
Constant	-0.373***	-0.449***	-0.675***
	(0.026)	(0.026)	(0.112)
Year specific dummies	No	No	Yes
Industry-specific dummies	No	No	Yes
Observations	50,467	50,467	50,467
R-squared	0.010	0.023	0.029

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1 Panel B has the same regressions as panel A; but only uses gross income as a measure of size as opposed to employee compensation.

In addition, similar patterns can be observed in panel B, and specification (3) suggests that a 10 percent increase in a firm's gross income is associated with a 0.36 percentage point increase in employment growth. Changes in both employee compensation and gross income capture changes in firm size, but employment growth may respond to these two measures differently, hence the difference in the magnitude of results. Finally, the coefficient on firm age is negative in both panels A and B, as expected. This shows that an increase in firm age is associated with a decrease in employment growth. Specifically, one more year of operation is, on average, associated with a decrease in employment growth by 0.01. The results discussed above further buttress the main findings in this chapter that employment growth increases with firm size and decreases with firm age for Ugandan firms.

One concern with the figures discussed in earlier subsections is that if a distribution of firms of different sizes is randomly assigned increases and decreases in employment, there will be no relationship between firm size and changes in employment. However, the firms that randomly get assigned negative changes in employment will be somewhat smaller than those who randomly get assigned positive changes – since firm size is measured as the average of two consecutive years of employee compensation. This means that smaller firms will likely have lower increases in employment than larger firms, even when no relationship exists. A similar occurrence is likely if the changes in employment have random measurement errors. One way to check if the main results of

net employment are robust to this kind of behavior is to define firm size in terms of the t-1 time periods only. The results from this robustness check are in Figure 3.7.

Figure 3.7: Employment Growth and Firm Size with Size defined in terms of $t-1$ periods

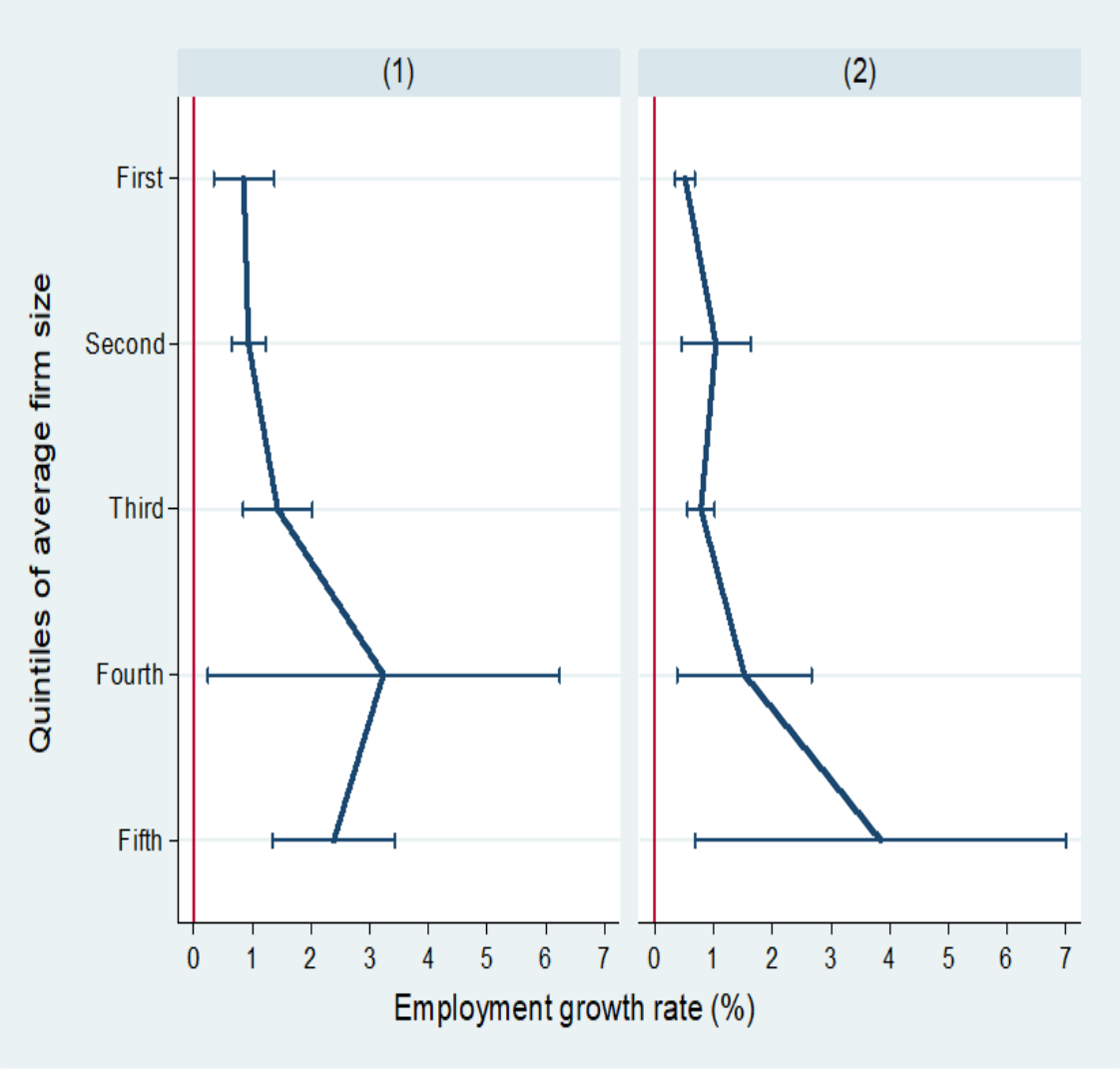


Figure 3.7 shows how employment growth changes when quintiles of employee compensation (specification (1)) and gross income (specification (2)) are used as a measure for firm size, with firm size defined in terms of $t-1$ periods The bands are the 95 percent confidence intervals around each expected employment growth value.

The results from Figure 3.7 show a somewhat positive correlation between employment growth and firm, even when firm size is constructed in terms of the t-1 time periods only. The results in both specifications suggest that employment growth between the first and third quintiles is about the same; there are increases in the fourth and fifth quintiles; however, the confidence intervals are wide in these two quintiles. Even though the positive correlations are not as strong as observed in the earlier figures, employment growth still shows an upward trend as firms increase in size.

The results discussed so far in this chapter are based on data that cover all formal firms in Uganda. However, Uganda's National Labor Force survey suggests that of the 19 million Ugandans of the working-age population, only 12.1 percent are in formal employment, implying that the majority of the workers are employed informally. The results discussed earlier may be true for formal employment, but they may not necessarily hold when considering informal enterprises. To check if the earlier conclusions in this chapter hold while including informal sector firms, informal enterprise data are pooled from the nationally representative Uganda Living Standards Measurement Study (LSMS) survey. The outcome variable in this chapter (employment growth) is regressed on the average number of employees. At the same time, enterprise age and its interaction with enterprise-size are added as control variables. Finally, enterprise-level fixed effects are added to control for enterprise-specific time-invariant characteristics. The results are in Table 3.4

Table 3.4: The Effect of Firm Size on Employment Growth using Living Standards Measurement Study Survey Data

	(1) Employment Growth
Average number of employees (Enterprise size)	2.469*** (0.520)
Enterprise Age	0.055 (0.035)
Enterprise Size # Enterprise Age	-0.056** (0.028)
Constant	-3.300*** (0.699)
Enterprise level fixed effects	Yes
Observations	1,662
R-squared	0.630
Number of clusters	1,061

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1, Enterprise size is constructed based on the Davis, Haltiwanger and Schuh (1996) definition of size as the two year average of the monthly number of employees by each enterprise..

Table 3.4 shows that a 1 percent increase in enterprise size is associated with a 2.5 percent increase in employment growth. The result is statistically significant at the 1 percent level. This result suggests that the largest informal and formal enterprises are likely to post the highest employment growth rates in Uganda. The finding also supports the main results in this chapter that employment growth increases with firm size in Uganda. The next section provides concluding remarks.

3.6 Conclusion

The main goal of this chapter was to explore how employment growth varies with firm size and age in a developing country context. Most of the analysis of employment growth and firm size had been focused on developed countries largely due to the limited availability of usable data from developing countries.

The analysis in this chapter uses business income tax returns dataset from Uganda, the findings suggest that, contrary to what Haltiwanger et al. (2013) find for United States firms, employment growth rates increase with firm size, and the relationship persists even after controlling for age and firm-specific characteristics. In addition, the findings also suggest that employment growth decreases with firm age. This result is consistent with what Haltiwanger et al. (2013) find for U.S. firms. The main addition to the literature from this chapter is that formal employment growth is highest for large young firms, these firms also destroy the most jobs but they also create many more such that the net effect is positive.

The positive correlation between employment growth and firm size is robust to alternative measures of firm size, and to the inclusion of informal sector firms in the analysis. Note that the findings in this chapter are not causal, but rather focus on measurement with the intent of shedding light on which firms contribute most to employment growth, create and destroy most jobs in Uganda. Finally, given the relatively high exit rate of firms, it might be worthwhile investigating the survival rates of firms in Uganda and how that might vary by sector/economic activity.

Bibliography

Adhikari, A., Derashid, C., and Zhang, H. (2006). "Public Policy, Political Connections, and Effective Tax Rates: Longitudinal Evidence from Malaysia." *Journal of Accounting and Public Policy*, *25*(5), 574-595.

Ali, M., Fjeldstad, O. H., & Sjursen, I. H. (2014). To pay or not to pay? Citizens' attitudes toward taxation in Kenya, Tanzania, Uganda, and South Africa. *World Development*, 64, 828-842.

Allingham, Michael. G., and Sandmo, Agnar. (1972). "Income tax evasion: A theoretical analysis." *Journal of Public Economics,* 1(3-4), 323-338.

Almunia, Miguel, and David Lopez-Rodriguez. (2018). "Under the Radar: The Effects of Monitoring Firms on Tax Compliance." *American Economic Journal: Economic Policy*, 10 (1): 1-38.

Angrist, Joshua. D., and Pischke, Jörn-Steffen. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton University Press.

Assaad, Ragui, Abdelaziz AlSharawy, and Colette Salemi. (2019) "Is The Egyptian Economy Creating Good Jobs? Job Creation and Economic Vulnerability from 1998 to 2018." In Economic Research Forum Working Paper Series (Forthcoming).

Assaad, Ragui, Caroline Krafft, and Shaimaa Yassin. (2020) "Job creation or labor absorption? An analysis of private sector job growth in Egypt." *Middle East Development Journal*: 1-31.

Ayyagari, Meghana, Asli Demirguc-Kunt, and Vojislav Maksimovic. (2014) "Who creates jobs in developing countries?" *Small Business Economics* 43(1): 75-99.

Baumol, William. J., Oates, Wallace. E., V. S. Bawa., W. S. Bawa, and Bradford, David. F. (1988). *The Theory of Environmental Policy*. Cambridge University Press.

Becker, G. S. (1983). "A Theory of Competition among Pressure Groups for Political Influence." *The Quarterly Journal of Economics*, 98(3), 371-400

Birch, David GW. (1987) "Job Creation in America: How our Smallest Companies Put the Most People to Work." University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership. Historical Research Reference in Entrepreneurship.

Blumenthal, M., Kalambokidis, L., and Turk, A. (2012). "Subsidizing Charitable Contributions with a Match Instead of a Deduction: What Happens to Donations and Compliance?." *National Tax Journal*, 65(1), 91-116.

Blundell, R., Dias, M. C., Meghir, C., and Van Reenen, J. (2004). "Evaluating the employment impact of a mandatory job search program." *Journal of the European Economic Association*, 2(4), 569-606.

Bolnick, Bruce. R., and Haughton, Jonathan. (1998*). Tax Policy in Sub-Saharan Africa: Examining the Role of Excise Taxation*. United States Agency for International Development, Bureau for Africa, Office of Sustainable Development.

Cabral, L., and Mata, J. (2003) "On the Evolution of the Firm Size Distribution: Facts and Theory." *American Economic Review* 93(4): 1075-1090.

Callison, Kevin., and Kaestner, Robert. (2014). "Do Higher Tobacco Taxes Reduce Adult Smoking? New Evidence of the Effect of Recent Cigarette Tax Increases on Adult Smoking." *Economic Inquiry*, 52(1), 155-172.

Carreras, M., Dachapalli, C., and Mascagni, G. (2017). "Effective Corporate Tax Burden and Firm Size in South Africa." United Nations University World Institute for Development Economics Research.

Chambers, R. G., and Quiggin, J. (2000). *Uncertainty, Production, Choice, and Agency: The State-contingent Approach*. Cambridge University Press.

Clements, M. B. J., Gupta, M. S., and Inchauste, M. G. (2004). *"Helping Countries Develop: the Role of Fiscal Policy."* International Monetary Fund.

Coase, Ronald. H. (1960). "The problem of social cost." *Classic Papers in Natural Resource Economics* (pp. 87-137). Palgrave Macmillan, London.

Corlett, Wilfred. J., and Hague, Douglas. C. (1953). "Complementarity and the excess burden of taxation." *The Review of Economic Studies*, 21(1), 21-30.

Davis, S. J., Haltiwanger, J., and Schuh, S. (1996). "Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts". *Small Business Economics*, 8(4), 297-315.

Davis, S. J., Faberman, R. J., Haltiwanger, J., Jarmin, R., and Miranda, J. (2010). "Business Volatility, Job Destruction, and Unemployment." *American Economic Journal: Macroeconomics*, 2(2), 259-87.

Fjeldstad, O. H. (2005). *Corruption in Tax Administration: Lessons from Institutional Reforms in Uganda*. Chr. Michelsen Institute.

Fjeldstad, O. H. (2003). "Fighting Fiscal Corruption: Lessons from the Tanzania Revenue Authority." *Public Administration and Development: The International Journal of Management Research and Practice*, 23(2), 165-175.

Gauthier, B., & Reinikka, R. (2006). "Shifting Tax Burdens through Exemptions and Evasion: An Empirical Investigation of Uganda." *Journal of African Economies*, 15(3), 373-398.

Glewwe, P., and Todd, P. (2021*). Impact Evaluation in Developing Countries: Theory, Methods and Practice*. The World Bank.

Gruber, Jonathan. (2005). *Public Finance and Public Policy*. Macmillan.

Gupta, S., and Newberry, D. (1997). "Determinants of the Variability in Corporate Effective Tax Rates: Evidence From Longitudinal Data." *Journal of Accounting and Public Policy*, 16(1), 1-34.

Hall, Robert E. (1979) "A theory of the natural unemployment rate and the duration of employment." *Journal of Monetary Economics* 5(2): 153-169.

Haltiwanger, John C., and Scott Schuh. (1999) "Gross Job Flows between Plants and Industries." *New England Economic Review*: 41-64.

Haltiwanger, John, Ron S. Jarmin, and Javier Miranda. (2013) "Who Creates Jobs? Small versus Large versus Young." *Review of Economics and Statistics* 95(2): 347-361.

Heckman, James. J., and Smith, Jeffery. A. (1999). "The Pre-programme Earnings Dip and the Determinants of Participation in a Social Programme. Implications for Simple Programme Evaluation Strategies." *The Economic Journal*, 109(457), 313-348.

Hines Jr, J. R. (2007). "Taxing Consumption and Other Sins." *Journal of Economic Perspectives*, 21(1), 49-68.

Hopenhayn, Hugo A. (1992) "Entry, exit, and firm dynamics in long run equilibrium." *Econometrica*: 60(5):1127-1150.

Jäger, S. (2001). Discourse and Knowledge: Theoretical and. *Methods of Critical Discourse Analysis*, 113, 32.

Jovanovic, Boyan. (1982) "Selection and the Evolution of Industry." *Econometrica*: 50(3): 649-670.

Keen, M., and Simone, A. (2004). "Tax Policy in Developing Countries: Some Lessons from the 1990s and Some Challenges Ahead." *Helping Countries Develop: The Role of Fiscal Policy*, International Monetary Fund.

Kim, K. A., and Limpaphayom, P. (1998). "Taxes and Firm Size in Pacific-Basin Emerging Economies." *Journal of International Accounting, Auditing and Taxation*, 7(1), 47-68

Krafft, Caroline, and Ragui Assaad. (2018) "Do More Productive Firms Pay Workers More? Evidence from Egypt." In Economic Research Forum Working Papers, no. 1222.

Laffont, J. J. (1988). *Fundamentals of Public Economics*. MIT Press.

Lazăr, S. (2014). "Determinants of the Variability of Corporate Effective Tax Rates: Evidence from Romanian Listed Companies." *Emerging Markets Finance and Trade*, 50(sup4), 113-131

Lazear, Edward P. (2000) "Performance Pay and Productivity." *American Economic Review* 90(5): 1346-1361.

Le Breton, M., and Salanié, F. (2003). "Lobbying under political uncertainty." *Journal of Public Economics*, 87(12), 2589-2610.

Mankiw, N. Gregory, Matthew Weinzierl, and Danny Yagan. (2009). "Optimal Taxation in Theory and Practice." *Journal of Economic Perspectives*, 23(4), 147-74.

Mascagni, G., and Mengistu, A. (2018). "Effective Tax Rates and Firm Size in Ethiopia." *Development Policy Review*. 37, O248-O273.

Meade, J. E. (1952). "External Economies and Diseconomies in a Competitive Situation." *The Economic Journal*, 62(245), 54-67.

Mertens, K., and Ravn, M. O. (2012). "Empirical Evidence on the Aggregate Effects of Anticipated and Unanticipated US Tax Policy Shocks." *American Economic Journal: Economic Policy*, 4(2), 145-81.

Mortensen, Dale T., and Christopher A. Pissarides. (1994) "Job Creation and Job Destruction in the Theory of Unemployment." *The Review of Economic Studies* 61(3): 397-415.

Neumark, David, Brandon Wall, and Junfu Zhang. (2011) "Do Small Businesses Create More Jobs? New Evidence for the United States from the National Establishment Time Series." *The Review of Economics and Statistics* 93(1): 16-29.

Nicodème, G. (2007). "Do Large Companies have Lower Effective Corporate Tax Rates? A European Survey." Centre Emile Bernheim Working Ppaer, (07/001).

Ramsey, Frank P. (1927). "A Contribution to the Theory of Taxation." *The Economic Journal*, 37(145), 47-61.

Reed, W. R. (2008). "The Robust Relationship between Taxes and US State Income Growth." *National Tax Journal*, 61(1), 57-80.

Richardson, G., and Lanis, R. (2007). "Determinants of the Variability in Corporate Effective Tax Rates and Tax Reform: Evidence from Australia." *Journal of Accounting and Public Policy*, 26(6), 689-704.

Salamon, L. M., and Siegfried, J. J. (1977). "Economic Power and Political Influence: The Impact of Industry Structure on Public Policy." *American Political Science Review*, 71(3), 1026-1043.

Sandmo, Agnar. (1987). "A Reinterpretation of Elasticity Formulae in Optimum Tax Theory." *Economica*, 89-96

Siegfried, J. J. (1974). "Effective Average US Corporation Income Tax Rates." *National Tax Journal*, 27(2), 245-259.

Stickney, C. P., and McGee, V. E. (1982). "Effective Corporate Tax Rates the Effect of Size, Capital Intensity, Leverage, and other Factors." *Journal of Accounting and Public Policy*, 1(2), 125-152.

Stigler, G. J. (1971). "The Theory of Economic Regulation." *The Bell Journal of Economics and Management Science*, 2(1), 3-21.

Watts, R. L., and Zimmerman, J. L. (1983). "Agency Problems, Auditing, and the Theory of the Firm: Some Evidence." *The Journal of Law and Economics*, 26(3), 613-633.

Yitzhaki, S. (1974). "A Note on Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics*, 3, 201-202.

Zimmerman, J. L. (1983). "Taxes and Firm Size." *Journal of Accounting and Economics*, 5, 119-149.